# BANGALORE METRO RAIL CORPORATION LIMITED

## BANGALORE METRO RAIL PROJECT PHASE-2B

# Shifting of 300mm, 150mm and 100mm dia DI water supply line of BWSSB Utilities infringing with Metro Alignment at proposed elevated Airport Metro Line at Indian Air Force (IAF) premises of BMRCL Phase - 2B Project.

**Tender File No. BMRCL/CEE-US/BWSSB/AL-PH-2B/2022-23/DPO/397**

## Summary of Tender Documents

**Volume – 1 : Qualification cum Technical Package**

- Section I - Notice Inviting Tender (NIT)

**Part - A**

- Section II - Instructions to Tenderers (ITT)
- Section III - General Conditions of Contract (GCC)
- Section IV - Special Conditions of Contract (SCC)
- Section V - Form of Tender
- Section VI - Proforma
    - Annexure A – Form of Agreement
    - Annexure B – Form of Bank Guarantee for Tender Security/EMD
    - Annexure C – Form of Bank Guarantee for Performance Security
    - Annexure D – Proforma Indemnity Bond
    - Annexure E – Tenderer's Declaration
    - Annexure F – Undertaking by The Tenderer
    - Annexure G – Work Experience
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**Part –B**

- Technical Specifications

**Volume – 2 : Financial Package**

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# VOLUME – 1

## SECTION - I

## NOTICE INVITING TENDER (NIT)

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**BANGALORE METRO RAIL CORPORATION LIMITED**
III Floor, BMTC Complex, K.H. Road,
Shanthinagar, Bangalore – 560 027
Karnataka, India
**E-mail:** contactus@bmrc.co.in; **Web:** www.bmrc.co.in;

No: BMRCL/2023-24/WS/WORK_INDENT2 Date: 04.08.2023

# TENDER NOTIFICATION

Bangalore Metro Rail Corporation Ltd., (BMRCL) a Joint Venture of Government of Karnataka (GoK) and Government of India (GoI), invites Tenders **(Single stage-Two Envelope System)** through Karnataka Public Procurement Portal (e-Procurement Portal) from the Tenderers having valid **"BWSSB License"** issued by the **Chief Engineer BWSSB, Government of Karnataka,** and having previous experience in the Works of BWSSB Water Supply / Sanitary installation, volume and complexity completed during the last Five (5) Years as mentioned in the Tender documents..

The brief scope of the work is provided in Instructions to the Tenderers (ITT) and the detailed description of work is provided in Technical Specifications.

## Key details:

| **Tender Notification No: BMRCL/2023-24/WS/WORK_INDENT2** | | |
|---|---|---|
| **Name of the Work:** Shifting of 300mm, 150mm and 100mm dia DI water supply line of BWSSB Utilities infringing with Metro Alignment at proposed elevated Airport Metro Line at Indian Air Force (IAF) premises of BMRCL Phase - 2B Project. | | |
| **Sl.No** | **Description** | |
| 1. | Estimated cost of Work | **Rs. 1,25,09,254.00**<br>(Rupees One Crore Twenty Five Lakh Nine Thousand Two Hundred and Fifty Four Only) |
| 2. | Tender Security / EMD (In Rs) | **Rs. 1,87,639.00**<br>The EMD (Tender Security) shall be furnished in the form of a Bank Guarantee (B.G) in favour of Bangalore Metro Rail Corporation limited. |
| 3. | Completion period of Works | 9 Months including monsoon period |
| 4. | Download of Tender Documents and Receipt of tender last date | Tender documents to be downloaded from Karnataka Public Procurement Portal (https://kppp.karnataka.gov.in)<br>As per Date and Time specified in e-Procurement Portal. |
| 5. | Last date for seeking Clarification | As per Date and Time specified in e-Procurement Portal on 25.8.2023 |
| 6. | Last Date and Time for Receipt of Bid / Tender | As per Date and Time specified in e-Procurement Portal on 29.08.2023. |
| 7. | Pre Bid Meeting | As per Date and Time specified in e-Procurement Portal on 22.08.2023. |
| 8. | Date and Time of Opening of Technical Bid/Tender Opening (Qualification Cum Technical Package) | As per Date and Time specified in e-Procurement Portal on 05.09.2023. |

| Sl.No | Description | |
|---|---|---|
| 9. | Date and Time of Opening of Financial Bid/Tender (Financial Package) | Will be intimated to the Qualified Tenderers through e- Procurement Portal. Tenderers to trace the same. |
| 10. | Place of Opening of Tender (Qualification Cum Technical Package & Financial Package) | The opening of the Qualification cum Technical Package shall take place at e-Procurement portal, i.e. https://kppp.karnataka.gov.in. |
| 11. | Address for Communication | **The Chief Engineer(U/S),**<br>Bangalore Metro Rail Corporation Limited.,<br>III Floor, BMTC Complex, KH Road,<br>Shanthinagar, Bangalore- 560027,<br>Karnataka, India.<br>Tele: +91 80 22969233, FAX +91 80 2296 9222,<br>E-mail: bnataraja@bmrc.co.in |

**Chief Engineer (U/S)**

**Bangalore Metro Rail Corporation Ltd**

**BANGALORE METRO RAIL CORPORATION LIMITED**
III Floor, BMTC, Complex,K.H. Road,
Shanthinagar, Bangalore – 560 027
Karnataka, India
**E-mail:** contactus@bmrc.co.in; **Web:** www.bmrc.co.in;

**Tender No. BMRCL/2023-24/WS/WORK_INDENT2** **Date: 04.08.2023**

## NOTICE INVITING TENDER

1. Bangalore Metro Rail Corporation Ltd., (BMRCL) invites Tenders from the eligible Contractors having valid **"BWSSB License"** issued by the Chief Engineer BWSSB**, Government of Karnataka,** for the work of **"**Shifting of 300mm, 150mm and 100mm dia DI water supply line of BWSSB Utilities infringing with Metro Alignment at proposed elevated Airport Metro Line at Indian Air Force (IAF) premises of BMRCL Phase - 2B Project"**.** Local competitive Bidding (LCB) will be conducted in accordance with the "Single Stage-Two Envelope" Tendering Procedure through Karnataka Public Procurement Portal (e-Procurement Portal). This Tender is a 'PERCENTAGE TENDER'.
2. Details of the Tender are as under:

| Sl. No | Name of the Work | Estimated Cost of work (INR) | Tender Security / EMD (INR) | Period of completion of work |
|---|---|---|---|---|
| 1. | Shifting of 300mm, 150mm and 100mm dia DI water supply line of BWSSB Utilities infringing with Metro Alignment at proposed elevated Airport Metro Line at Indian Air Force (IAF) premises of BMRCL Phase - 2B Project. | **1,25,09,254/-** | 1,87,639/- | 9 Months |

3. **REGISTRATION:**

   a) Tenderers are required to enroll on the Karnataka Public e-Procurement Portal (https://kppp.karnataka.gov.in) by clicking on the link "Tenderers Registration" on the Karnataka Public Procurement Portal by paying requisite registration fee

   b) As part of the enrolment process, the Tenderers will be required to choose a unique user name to assign a password for their accounts.

   c) Tenderers are advised to register their valid email addresses and mobile numbers as part of the registration process. These would be used for any communication with the Tenderer.

   d) Upon enrolment, the Tenderers will be required to register their valid Digital Signature Certificate (Only Class III Certificates with signing + encryption key usage) issued by any Certifying Authority recognized by CCA India.

   e) Only one valid DSC should be registered by a Tenderer. Please note that the Tenderers are responsible to ensure that they do not lend their DSC"s to others which may lead to misuse.

   f) Tenderers then login to the website through the secured log-in by entering their user ID/password and the password of the DSC / e-Token.

g) The scanned copies of all original documents (as required) should be uploaded on portal in PDF/JPG format.

h) For any query regarding e-procurement on the Karnataka Public Procurement Portal, contact helpdesk number: +91-8046010000, +91-8068948777, support@eprochelpdesk.com.

4. **SEARCHING FOR TENDERS/BIDS:**

Once the Tenderers have selected the proposal bids/tenders and if they are interested to participate, the Tenderers can pay non-refundable processing fee to Karnataka Public Procurement Portal.

However, the tenderer shall submit such transaction details along with their tender submission on e-portal. If the same transaction reference number has been submitted for more than one bid, all such bids shall be considered ineligible and summarily rejected.

It will be the responsibility of the Tenderer to check the website and see any Addendum/Corrigendum issued in this tender from time to time and ensure submission of Tender submittals binding accordingly.

5. Tender documents consist of the following Volumes/Parts/Sections,

**Volume – 1: Qualification Cum Technical Package**

- SECTION – I Notice Inviting Tender.

**Part - A**

- SECTION – II Instructions to Tenderers.
- SECTION – III General Conditions of Contract
- SECTION – IV Special Conditions of Contract
- SECTION – V Form of Tender
- SECTION – VI Proforma

**Part – B**

- Technical Specifications

**Volume – 2: Financial Package**

6. Tenderer's submittals must be accompanied by a EMD/Tender Security for an amount as mentioned at in the table under Tender Notification clause 2, in the requisite form as described in clause 16 of Instructions to Tenderers (ITT). The EMD shall be valid for a period of 45 days beyond the validity of Tender.
7. Tenders must be submitted electronically through Karnataka Public Procurement Portal (https://kppp.karnataka.gov.in) before the last date & time prescribed in the e-procurement portal using a valid DSC (Digitally Signed Certificate).

All Tenderers are requested to note that the original of those documents in hardcopy as listed under ITT clause 13.2 should be submitted by 'Speed post' or 'in person' at BMRCL office within **5 days** from last date of Tender submission. Tender submission without such submission of original documents shall be liable for rejection.

8. 'Qualification cum Technical Package' will be opened as per the latest specified time and date published in the e-Procurement portal.

The Financial Packages of technically qualified Tenderers will be opened at a date and time advised by BMRCL through e-Procurement portal.

9. The Tenderer shall provide credentials in support of their eligibility, qualifying criteria, technical capability, financial strength/support and past work experience by supporting documents / client certificates / CA's audit reports set forth in ITT Clause 2.

10. Tenders shall be valid for a period of **120 days** from the last date for submission of Tenders.
11. Tenders cannot be submitted online after stipulated time of submission of Tender.
12. The Contract shall be governed by the stipulations of documents listed under 'Contract Agreement' as per Annexure-A Section-VI - Proforma.
13. BMRCL requires that Tenderers and Contractors observe highest standard of ethics during the procurement and execution of Contract. In pursuance of this policy, the Employer;
    a) Will reject the Tender for the Work or rescind the Contract, if BMRCL determines that the Tenderer / Contractor have engaged in Corrupt or Fraudulent practices, at any stage.
    b) will declare a Contractor ineligible, either indefinitely or for a stated period of time, to be awarded a Contract, if he at any time determines that the Tenderer or the Contractor has engaged in Corrupt or Fraudulent practices in competing for, or in executing, the contract.
14. BMRCL reserves the right to accept or reject any or all Tenders in part or full without assigning any reasons. No Tenderer shall have any cause of action or claim against BMRCL for rejection of his Tender.
15. Registered Tenderers with e-token are advised to frequently check the e-Procurement portal for any amendments like Addendum / Corrigendum.
16. BMRCL will not be held responsible for consequential damages/losses due to lack /interruption of power supply & internet, low speed of internet, System problems, loss of electronic information/data etc.
17. For further clarifications/details regarding the Tender document, contact: The Chief Engineer (Utility Shifting), BMRCL on +91 80 2296 9233, Fax +91 80 2296 9222, Email: bnataraja@bmrc.co.in.

    For any query regarding eProcurement portal/ Tender submission, please contact helpdesk at +91-80-46010000, +91-80-68948777, Email: support@eprochelpdesk.com.

**Chief Engineer (U/S)**
**Bangalore Metro Rail Corporation Ltd**

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# PART - A

| | | |
|---|---|---|
| Section II | - | Instructions to Tenderers (ITT) |
| Section III | - | General Conditions of Contract (GCC) |
| Section IV | - | Special Conditions of Contract (SCC) |
| Section V | - | Form of Tender |
| Section VI | - | Proforma |

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# SECTION – II

# INSTRUCTIONS TO TENDERERS (ITT)

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# SECTION- II: INSTRUCTIONS TO TENDERERS

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# SECTION II – INSTRUCTIONS TO TENDERERS (ITT)

## A. GENERAL

### 1. Brief Description of the Project

1.1 Bangalore Metro Rail Corporation limited (BMRCL), a Special Purpose Vehicle (SPV) established under the Companies Act, 1956 (hereinafter referred to as "BMRCL" or "the Company" or "the Employer" or "the Client") invites Tenders from the registered BWSSB Contractors **("BWSSB License" issued by the Chief Engineer BWSSB, Govt. of Karnataka)** under single stage two packet system for **"Shifting of 300mm, 150mm and 100mm dia DI water supply line of BWSSB Utilities infringing with Metro Alignment at proposed elevated Airport Metro Line at Indian Air Force (IAF) premises of BMRCL Phase - 2B Project"** as per terms and conditions contained in this Tender documents.

Bangalore Metro Rail Corporation Ltd. (BMRCL) is implementing the Bangalore Metro Rail Project in different phases. The Phase – I of the project comprises of two Corridors Viz. East-West Corridor (Purple line) and North– South Corridor (Green line) consisting of Elevated, at Grade and Underground sections as below:

| Sl. No | Corridor/Section | Number of Stations | Approx. Length (Km) |
|---|---|---|---|
| 1 | East–West corridor (Purple line) from Baiyappanahalli Station to Mysore Road Station. | 17 | 18.10 |
| 2 | North- South corridor (Green line) from Nagasandra Station to Yelachenahalli Station. | 23 | 24.20 |
| **Total** | | **40** | **42.30** |

1.2 BMRCL is proceeding with the implementation of Phase-2 of the project. The sanctioned Detailed Project Report (DPR) of Phase-2 envisages extension of existing two corridors viz. East-West (Purple line) and North-South (Green Line) Corridors comprising of elevated sections and construction of two new lines Reach-5 and Reach-6.

The details of Extension lines and New lines under Phase-2 are given below:

| Sl. No | Corridor/Section | Number of Stations | Length (Km) |
|---|---|---|---|
| 1 | **East Extension (R1A & R1B):** Baiyappanahalli to ITPL Whitefield (Elevated) with Depot at Whitefield | 13@ | 15.42 |
| 2 | **West Extension (R2A & R2B):** Mysore Road to Challaghatta (Elevated) with Depot at Challaghatta | 7 | 8.85 |
| 3 | **North Extension (R3C):** Nagasandra to Bangalore International Exhibition Centre (BIEC) (Elevated) with Depot at Peenya | 3 | 2.95 |
| 4 | **South Extension (R4B):** Yelachenahalli to Silk Institute (Elevated) with Depot at Anjanapura | 5 | 6.55 |

| Sl. No | Corridor/Section | Number of Stations | Length (Km) |
|---|---|---|---|
| 5 | **Reach-5** : R V Road to Bommasandra Industrial Area (New Line - Elevated) with Depot at Hebbagodi | 16[$] | 18.82 |
| 6 | **Reach-6 (Elevated)**: Kalena Agrahara to Swagath Road Cross (New Line) with Depot at Kothanur | 6[$] | 8.18 |
| | **R6 (Underground)**: Swagath Road Cross to Nagavara (New Line) with Depot at Kothanur | 12[#] | 14.27 |
| **Total** | | **62** | **75.04** |

*@ - includes two-level common interchange station at K.R. Puram with ORR Metro line.*

*$ - includes two-level common interchange (between Reach-5 & Reach-6) station at Jayadeva Hospital. Also Stations at Rashtreeya Vidyalaya (R.V) Road & Central Silk Board shall have interchange with other lines of BMRCL.*

*# - includes two-level common interchange stations at M.G. Road and Nagavara with other lines of BMRCL.*

South Extension is commissioned in January 2021 West Extension in August 2021, East extension in March-2023 and other Reach is under advanced stage of completion.

1.3 Two more new lines under Phase-2A and Phase-2B are being constructed. Details of New lines under Phase-2A and 2B are given below:

| Sl. No. | Corridor/Section | Number of Stations | Length (Km) |
|---|---|---|---|
| 1 | **Phase- 2A**: Silk board to K R Puram with Depot at Baiyappanahalli Phase 2A (8+8 stabling lines at grade and -1 level) | 14 Number of Stations (All Elevated Stations) | 19.75 |
| 2 | **Phase-2B**: K R Puram to Airport Terminal with two Depots at Baiyappanahalli Phase 2B (14+14 stabling lines at grade and -1 level) and Trumpet | 18 Number of Stations (16 Elevated Stations, 1 UG Station & 1 at grade Station) | 38.44 |
| **Total** | | 31 Number of Stations | **58.19** |

***Interchange Stations** of different lines: -*

- *The common interchange station between Reach-6 line and Phase-2B line is at **Nagavara** station.*
- *The common interchange station between Phase-2A and Reach-5 is at **Central Silk Board** station.*
- *The common interchange station between Phase-2A and Line-1 is at **KR Puram** Station.*

Maintenance Depots are located at Baiyappanahalli for Phase-2A & 2B and Airport (Trumpet) Depot for Phase-2B. An Integrated Operation Control Centre (OCC) is being constructed at Baiyappanahalli for Reach-5, Reach-6, Phase-2A (ORR) & Phase-2B (Airport line) and a Back-up Control Centre (BCC) is located at Peenya.

**1.4 Brief Scope of Work:**

The work shall include, but not limited to Supply, Installation, Testing and commissioning of BWSSB / BMRCL water supply, sanitary and civil construction works etc….

Tenders not covering the entire specified scope shall be treated as incomplete and rejected.

The details of equipment to be supplied, transported, erected, assembled, tested & commissioned are indicated in schedule of Works. The quantities indicated in the Schedule of works are only approximate and may increase or decrease and prices quoted by the Tenderer are deemed to be valid in spite of such variations in the quantities at the time of award of Contract subject to SCC Clause 10.

Any other items not specifically mentioned but which are essentially required for satisfactory performance & completeness of work, shall be deemed to be included in the scope of specifications and works and the same shall be executed / carried out by the Tenderer at no extra cost to BMRCL.

**2 Technical/ Financial Eligibility Criteria for Tenderers:**

2.1 The Tenderer shall have proven track record and must satisfy the criteria stated below for further evaluation and selection.

2.2 The Tenderer should have a valid **"BWSSB License"** issued by the Chief Engineer BWSSB, Government of Karnataka. Attested copy of the License shall be furnished. Original Document of the license shall be produced for verification by BMRCL after opening of the Qualification cum Technical Package as requested.

2.3 **Technical Eligibility Criteria:**

The Tenderer should have an experience of carrying out similar BWSSB works such as: Working in all class of BWSSB water supply / sanitary engineering civil construction works should have completed similar works during the last five years ending 28 days prior to date of opening of Tender and fulfill the following to establish the same:

i. The Tenderer should have completely executed at least **One similar work** valued not less than **Rs. 62,54,627/- (Rupees Sixty Two Lakhs Fifty Four Thousand Six Hundred and twenty Seven Only)**

OR

ii. The Tenderer should have completely executed at least **Two similar works** each of value not less than **Rs. 50,03,702/- (Rupees Fifty Lakhs Three Thousand Seven Hundred and Two Only).**

OR

iii. The Tenderer should have completely executed at least **Three similar works** each of value not less than **Rs. 37,52,776/- (Rupees Thirty Seven Lakhs Fifty Two Thousand Seven Hundred and Seventy Six Only).**

***Note:*** *The Tenderer shall furnish client's certificates in support of the same. The work completion Certificate issued by client shall mention the nature of work, items and quantity of work executed and the date of completion of work as mentioned above.*

2.4 **Financial Eligibility Criteria:**

*Annual Turnover: Each Tenderer in his name should have achieved in at least two (2)* out of the last five (5) financial years period (2017-18, 2018-19, 2019 - 20, 2020-21 and 2021-22) an annual turnover of **Rs 2,50,18,508/- (Rupees Two Crore Fifty Lakhs Eighteen Thousand Five Hundred and Eight Only)**.

2.5 **Tender Capacity:**

Eligible Tenderers will get qualified only if their available Tender capacity is more than the Tender value. The Tenderer's Tender capacity will be calculated as under:

**Tender Capacity = (A X N X 1.5) – B**

Where,

***A*** = *Maximum value of Works executed in any one year during the last five years (updated to 2022-23 Price level) taking in to account the completed as well as works in progress.*

***N*** = *No. of years prescribed for completion of the works for which Tenders are invited.*

***B*** = *Value, at 2022-23 price level, of existing commitments and ongoing works to be completed during the next 9 Months, the planned contract period.*

2.6 The Tenderer should not have been black listed by BWSSB/KPTCL / BESCOM / BBMP / KPWD /CPWD / Railways /MES / National High way or erstwhile KEB or by any department of Government of Karnataka and any other Central Government department including PSUs. An undertaking to that effect shall be furnished as per Annexure F in Section VI Proforma.

2.7 **Joint Venture or Consortium is not permitted in this Tender.**

2.8 **DETAILS OF KEY PERSONNEL**

**i) For Fresh Tenderers.**

The details of deployment of the following personnel should be furnished in Format I.

**Format I:**

| Sl. No | Details of Personnel to be deployed for the tendered works. | Name of the Person | Educational Qualification | Experience | Remarks |
|---|---|---|---|---|---|
| 1. | Project Manager | | BE / Equivalent | 10 Years | |
| | Project Engineer | | BE / Diploma | 6 Years | |
| | Site Engineer/s | | Diploma | 3 Years | |

i) **For BMRCL Working Contractors (Those who are already working in BMRCL as Contractors):**

Contractors those who are already awarded Work by BMRCL and intend to participate in the Tender, shall possess the following additional requirements for qualifying in the Tender.

a) Separate team of personnel is required to be deployed for each works, particularly the Project Engineers and the Site Engineers. The curriculum Vitae of the personnel deployed/to be deployed shall be furnished as detailed in Clause (b) below.

b) The details of deployment of the following personnel should be furnished in Format II.

**Format II:**

| Sl. No | Details of Personnel working for the tendered works. | Name of the Person | Educational Qualification | Experience | Remarks |
|---|---|---|---|---|---|
| 1. | **Personnel for the ongoing work/s:** | | | | |
| | Project Manager | | BE /Equivalent | 10 Years | |
| | Project Engineer | | BE / Diploma | 6 Years | |
| | Site Engineer/s | | Diploma | 3 Years | |
| 2 | **Personnel for the new tendered work:** | | | | |
| | Project Manager | | BE /Equivalent | 10 Years | |
| | Project Engineer | | BE / Diploma | 6 Years | |
| | Site Engineer/s | | Diploma | 3 Years | |

2.9 Notwithstanding anything stated above or elsewhere in the Tender specification, BMRCL reserves the right to relax the qualifying requirements and assess the capability/suitability of the Tenderer to perform the overall Contract should the circumstances warrant such assessment in the overall interest of BMRCL.

2.10 The Tenderer shall furnish certified copies of financial reports such as profit and loss statements, balance sheets, auditor's reports, in support of the same, for the financial years 2017-18, 2018-19, 2019-20, 2020-21 and 2021-22. (Provisional financial statements are not acceptable).

2.11 The Tenderer shall furnish documentary evidence in support of the qualifying requirements stipulated above.

**3 Cost of Tendering.**

The Tenderer shall bear all expenses associated with the preparation and submission of his Tender and the cost of Tender documents/drawings. BMRCL shall in no case be responsible or liable for reimbursement of such expenses or other claims regardless of the conduct or outcome of the Tendering process.

**4 Site Visits**

4.1 The Tenderer is advised to visit and examine the Site of Works (Kiosks) and familiarize themselves with the nature of work, site conditions, its surroundings and obtain on his own responsibility all information including constraints that may be necessary for preparing the Tender and entering into Contract and carrying out the work. The costs of any such visits shall be entirely at the Tenderers own expense.

4.2 The Tenderer or any of his authorized personnel will be granted permission by BMRCL to enter their premises for the purpose of such inspection, but only on the express condition that the Tenderer and/or his authorized agents, will release and indemnify BMRCL, from and against all liabilities in respect thereof and will be responsible for personal injury (whether fatal

or otherwise), loss of or damage to property and any other loss, damage, cost and expenses, however, caused which but for the exercise of such permission would have not arisen.

4.3 The Tenderer shall be deemed to have inspected and examined the site and collected all necessary information regarding all factors and conditions likely to influence in carrying out the work, before uploading on e-procurement portal and submitting his Tender.

**5 Brand Names**

5.1 Specific reference in the specification to any material by trade name or catalogue number shall be construed as establishing a standard of quality and performance. However, during construction, Tenderers may offer equivalent brand for approval of Engineer-in-charge. It is assumed that the rates quoted cover the cost of specified brands.

5.2 All materials used shall conform to technical specifications, relevant standards and BMRCL / BESCOM / BMRCL approved makes.

**6 Stamp Duty and Legal Charges**

It shall be the responsibility of the successful Tenderer to pay stamp duty for Contract Agreement or any other matter in connection with the Contract, as per the applicable Government regulations.

**7 Time for Completion of Work**

Time for completion of the work shall be as stated in Appendix for Form of Tender (Section V).

**8 Work Plan**

8.1 Within 15 days of award of contract, the successful Tenderer shall submit on the portal a detailed work plan along with manpower deployment in line with ITT 2.8 for the implementation of work complying with the schedule of work as stipulated in the Tender document for supply, installation, testing and commissioning.

8.2 The Tenderer to furnish along with Tender submittals, a list of construction plant, equipment's, list of jobs on hand, name of the Project Engineer for this work to facilitate Tender evaluation.

8.3 The work shall be executed as per BWSSB / BMRCL requirements.

## B. TENDER DOCUMENTS

**9 Content of Tender Documents**

9.1 The Tender consists of the following documents, together with addendum/corrigendum, if any.

**Volume – 1: Qualification Cum Technical Package**

SECTION – I Notice Inviting Tender.

**Part - A**

SECTION – II Instructions to Tenderers.

SECTION – III General Conditions of Contract

SECTION – IV Special Conditions of Contract

SECTION – V Form of Tender

SECTION – VI Proforma

**Part – B**

Technical Specifications

**Volume – 2: Financial Package**

**10 Interpretation and Clarification of Tender Documents**

11.1 Tenderers shall carefully examine the Tender Documents and fully understand the conditions and matters which may affect the work or the cost thereof. In case the Tenderer finds any discrepancies or omission from the specification or other documents, or in doubt as to their meaning, the Tenderer shall at once address query (ies) online through Karnataka Public Procurement Portal (e-Procurement portal).

BMRCL will offer clarification to such queries received through eProcurement portal up to the date specified therein. Any such queries with details of clarification sought, will be uploaded in the eProcurement portal (https://kppp.karnataka.gov.in) without disclosing the identity of the Tenderer seeking clarification. No separate further communication in this regard will be entertained.

**11 Amendment of Tender Documents**

11.1 At any time prior to the deadline for the submission of Tenders, BMRCL may, for any reason, whether at their own initiative or in response to clarifications requested by prospective Tenderers modify, the Tender document by issuing Addenda / Corrigendum.

11.2 Such Addenda / Corrigenda will be uploaded in the eProcurement portal. It will be the responsibility of the Tenderer to frequently check the portal for any Addenda/Corrigenda or any other updates issued from time to time and ensure submission of Tender accordingly.

11.3 The Tenderer is not permitted to make any alterations/modifications to the Tender conditions. No modifications to the specifications, item descriptions, etc. will be entertained.

## C. PREPARATION OF TENDERS

**12 Language of the Tender**

12.1 Tenders and all accompanying documents shall be in English. In case any accompanying printed literature is in other language, it shall be accompanied by an English translation. The English version shall prevail in matters of interpretation.

**13 Documents Comprising the Tender**

13.1 The Tender submittals shall comprise the following documents and Tenderer shall upload clear and readable scanned copies of these documents on e-Procurement Portal.

**i. Qualification cum Technical Package:**

a) Tender Security / EMD, in accordance with ITT clause 16. In case of non-legible EMD document, tender will be summarily rejected.

b) A Covering Letter stating any other matter in relation to his Tender which the Tenderer considers should be drawn to the particular notice of BMRCL.

c) Valid “BWSSB License” issued by the Chief Engineer, BWSSB, Government of Karnataka.

d) Tenderer’s Declaration as per Annexure-E, Section-VI.

e) Tenderer’s Undertaking as per Annexure-F, Section-VI.

f) Work Experience details as per Annexure-G, Section-VI

g) Work completion certificate(s) to establish the Eligibility Criteria.

h) Financial eligibility information as per Annexure-H, Section-VI.

i) Contractor's Equipment/Machinery Details as per Annexure-I, Section-VI.

j) List of manpower including the Bio-Data of Engineer-in-charge.

k) Notarized Power of Attorney of the person who is signing the Tender submittals.

l) Tender Index indicating all the Tender submittals with identical page numbers.

m) Any other document required under the provisions of Tender document.

**ii. Financial Package**

The Tenderer shall fill in and complete the 'Financial Package' online through Karnataka Public Procurement Portal only and no hardcopy of commercials should be attached or disclosed elsewhere.

13.2 **Original Documents (Hardcopy):**

The Tenderer is required to submit the following documents in original (hard copy) within the date time and place mentioned in ITT clause 20.7:

(i) Tender Security / Earnest Money Deposit (EMD), as per ITT clause 16,

(ii) Notarized Power of Attorney and Board Resolution (as applicable) as per ITT clause 18.

(iii) Any other documents as specified in the tender document.

In case of failure in submission of the above documents within stipulated date, the Tender may be treated as incomplete and be liable for rejection.

**14 Tender Prices**

14.1 The Tender is **Percentage Tender**. The Contract shall be for the whole of the works as described in the tender documents and the cost of all the individual items shall be computed for the entire work and the Tender premium (above or below or at par) on the Total cost shall be quoted.

14.2 Contract prices shall be inclusive of all applicable taxes, duties and cess including taxes to be deducted at source, Insurance and exclusive of SGST and CGST as specified under GCC clause 26. BMRCL shall pay the SGST and CGST as applicable as per laws. The evaluation and comparison of Tenders shall be made accordingly by BMRCL. No claim will be entertained on this account after acceptance of the Tender or during the currency of the Contract.

14.3 Any additional item/s which is not found in the BOQ, if required for completion of the work under this Contract, the rate for which shall be as per referred KPWD / BESCOM Schedule of Rates plus accepted Tender premium. If the item/s required is not found in any of the State Schedule of Rates, then market rate shall be adopted, but no Tender premium would be applicable.

14.4 If the Tender submittal contains any handwritten portion, it shall be ensured that such writing is clear, legible and duly authorized by the person signing the Tender and that no over writing or erasing is adopted, failing which the Tender is liable for rejection.

14.5 The Tenderer shall keep the contents of his tender and percentage quoted by him confidential.

**15 Currencies of Tender and Payment**

15.1 The price shall be quoted in Indian Rupees only. All payments to the Tenderer, under the proposed Contract shall be in Indian Rupees.

**16 Tender Security / Earnest Money Deposit (EMD)**

16.1 The Tenderer shall furnish, as part of its Tender, interest free Tender Security / EMD as per Karnataka Public Procurement Portal.

16.2 The Tender Security / EMD is required to protect BMRCL against the risk of Tenderer's conduct which would warrant the security's forfeiture.

16.3 The Tender shall furnish with his tender, an EMD (Tender Security) for the value indicated in e-Procurement Portal in any of following mode:

a) The tenderer shall pay full EMD (Tender Security) amount through e-procurement portal by making online payment through the e-Procurement Portal.

OR

b) The tenderer shall pay full EMD (Tender Security) as mentioned on the portal shall be furnished in the form of a Bank Guarantee (B.G) issued in favour of Bangalore Metro Rail Corporation Ltd., from Indian Schedule Bank (excluding Co-operative banks) or from a Scheduled Foreign Bank as defined in section 2(e) of RBI Act 1934 read with Second preferably drawn on and payable and extendable at a designated Branch in Bangalore, as per the proforma given in Annexure-B, Section-VI.

The Tender Security/EMD shall remain valid for a period specified in 'Appendix to Form of Tender'. The validity of Tender Security/ EMD shall be extended by the Tenderer suitably in line with the extension of Tender validity as per ITT clause 17.

The Scheduled Bank issuing the Bank Guarantee should preferably be on "Structure Financial Messaging System (SFMS)" platform. A separate advice of the BG shall preferably be sent by the issuing bank to the Employer's Bank through SFMS.

The issuing Bank shall send the SFMS to:

Name: BANGALORE METRO RAIL CORPORATION LTD.,
Name of the Bank: BANK OF INDIA
Branch: CANTONMENT BRANCH, BENGALURU.
Account No: 840420110000760
RTGS/IFSC: BKID0008404

The scanned copy of the BG and a copy of "MT760COV (for Bank Guarantee message) / MT767COV (for Bank Guarantee amendment message) Report" sent by the BG issuing Bank, should be uploaded by the tenderer in the e-Procurement Portal as a part of his offer during tender submission. The tenderers should ensure that both the documents (scanned copy of BG and copy of SFMS message) are uploaded to the e-procurement portal, failure of which, the tender will be summarily rejected by the Employer. The Original Bank Guarantee shall compulsorily be submitted in the BMRCL office before scheduled date, time and place

as specified under ITT clause 20.7. The tenderer shall note that the Original Bank Guarantee submitted through speed post/ in person, if not received before the scheduled date and time as specified in ITT clause 20, the Tender will be summarily rejected.

The details of the Bank Guarantee, Physically submitted should match with the details available of the scanned copy uploaded and the data entered during Tender submission time, failing which, the Tender will be rejected.

In case of non-reconciliation of online EMD (Tender Security) portion through e-Procurement portal in Government of Karnataka central pooling account held at the ICICI Bank, the tender will get rejected.

16.4 Tender Security/EMD will not be accepted in any form other than those mentioned above. Tenders not accompanied by the required amount of Tender Security/EMD and non-submission of hardcopy as per ITT clause 20.7 will be rejected by the Employer.

However, BMRCL reserves the right to accept or reject the Tender Security/EMD with any deficiency otherwise not materially affecting the technical qualification criteria of the Tenderer.

16.5 The Tender Security/EMD of unsuccessful Tenderers will be released / returned, when the Contract Agreement has been signed with the successful Tenderer. However, the Tender security of the successful Tenderer will be released/returned on receipt of the Performance Security / Security Deposit by the Employer and upon signing of the Contract Agreement as per Annexure-A, Section VI.

16.6 The Tender Security/EMD may be forfeited:

a. If a Tenderer withdraws his Tender during the period of Tender validity,

OR

b. If a Tenderer resiles abandon from a Tender,

OR

c. In case the successful Tenderer fails to:
   (i) furnish the required Performance Security / Security Deposit as per ITT clause 32, and
   (ii) sign the Contract Agreement as per ITT clause 33 and GCC clause 12.

16.7 The tender will be summarily rejected by the Employer in case of:

(i) Failure to deposit online EMD portion and failure to upload clear & readable copy of Bank Guarantee towards EMD.

(ii) Failure to submit the Original Bank Guarantee to BMRCL Office within the date & time specified.

(iii) EMD (Tender Security) in the form of Bank Guarantee is from any source other than an Indian Scheduled Bank and Scheduled Foreign Bank as defined in Section 2 (e) of RBI Act 1934 read with Second Schedule.

(iv) The EMD (Tender Security) in the form of Bank guarantee is from a Co-operative bank.

(v) The EMD (Tender Security) amount is less than the required amount as mentioned in NIT.

(vi) The Bank Guarantee's validity is less than Tender validity as mentioned in clause 17 of Instructions to tenderers (ITT).

In case EMD (Tender Security) is in the form of BG, and BG validity fulfils the 'Tender Validity Period', but falling short in regard to period of 'EMD (Tender Security) Validity' , the Employer shall request such Tenderer(s) in writing to submit compliant EMD (Tender Security) within 10 (Ten) working days from the date of request. Failure to provide a compliant EMD (Tender Security) within the prescribed period shall cause the rejection of the Tender and it will be considered as Non-responsive.

**17 Tender Validity**

17.1 Tenders shall be valid for acceptance for such period as stated in 'Appendix to Form of Tender' (Section-V). Tenders valid for a period shorter than specified period of validity as aforesaid shall be rejected.

17.2 In exceptional circumstances, prior to expiry of the original Tender validity period, the Employer may request the Tenderers to extend the validity for a specified additional period. The request and the responses thereto shall be made in writing only or by facsimile or E-mail. A Tenderer may refuse the request without forfeiting the Tender Security/EMD. A Tenderer agreeing to the request will not be required or permitted to modify his Tender. Only one communication either extending the validity or refusing to extend the validity would be entertained. If the validity is not extended, no further representation, if any, to revive the Tender at a later date will be entertained.

**18 Format and signing of Tenders**

18.1 The Tenderer shall follow and submit the Tender documents in the respective formats prescribed under section -VI- proforma only.

18.2 The Tender submittals shall be typed or written in indelible ink (wherever required), which is to be scanned and digitally signed using class-III digital signature by person(s) duly authorized to bind the Tenderer to the Contract. Proof of authorization shall accompany the Tender in the form of notarized 'Power of Attorney'. All pages of the Tender where entries, amendments, corrections, alterations, erasures etc. have been made shall be initialized by the person(s) signing the Tender.

18.3 All witnesses and sureties shall be persons of status and probity and their full names, occupations and addresses shall be stated below their signatures.

**19 Alternative Proposal by Tenderers**

19.1 Tenderers shall submit offers that comply with the requirements of the Tender documents, including the basic technical design as indicated in the drawing and specifications. Alternatives will not be considered.

## D. SUBMISSION OF TENDERS

### 20 Submission of Tenders

20.1 All Tender Proposals digitally signed along with the other Qualifying documents should be submitted Electronically through Karnataka Public Procurement Portal on or before the last date and time for Tender submission as published therein.

20.2 Tenderer, in advance, should get ready the proposal documents to be submitted as indicated in the Tender document / schedule in PDF /JPEG formats.

20.3 Tenderer should log into the portal well in advance for the submission of the proposal so that it gets uploaded well in time, i.e. on or before the last date & time for Tender submission. Tenderer will be solely responsible for any delay due to other issues.

20.4 The Tenderer has to digitally sign and upload the required proposal documents one by one as indicated in the tender document.

20.5 The server time (which is displayed on the dashboard) will be considered as the standard time for referring the deadline for submission of the proposals by the Tenderers, opening of proposals etc. The Tenderers should follow this time during proposal submission.

20.6 The necessary certificates/documents in support of fulfilling eligibility criteria and Technical requirements shall be scanned and attached to e-Procurement portal.

20.7 **Original documents to be submitted in hardcopy:**

The Tenderer shall seal and submit the original documents listed in ITT clause 13.2 in original (hard copy) by speed post or in person at BMRCL office within **5 days** of last date of online Tender submission. Only the tender(s) submitted & accepted online, the hardcopies will be considered for evaluation. The Hardcopies should carry/accompany copy of soft copy submitted, time and acceptance acknowledgement from Employer e-Procurement Portal.

The envelope shall bear the following identification:

**TENDER NO. ……..**

**ORIGINAL SUBMITTALS OF QUALIFICATION CUM TECHNICAL PACKAGE**

BMRCL office address for Submission of hard copy:

The Chief Engineer (U/S),
Bangalore Metro Rail Corporation Limited,
III Floor, BMTC Complex,
K.H. Road, Shanthinagar,
Bangalore-560 027,
Karnataka, India.

The tenderer can submit the hard copies by speed post or in person at the above address during 11.00 AM to 5.00 PM on all working days. In case 5$^{th}$ day happens to be a holiday then the next working day shall be construed as last day for submission of the hard copies.

20.8 All Tenderers have to submit “unconditional Tenders and without any deviations”, together with requisite Tender Security/EMD.

### 21 Deadline for Submission of Tenders

21.1 Tenders must be submitted online through Karnataka Public Procurement Portal on or before the date & time as specified in the Portal and in time submission of tender is the responsibility of the Tenderer. Original document (hardcopy) as listed under ITT 13.2 shall be in the place, date & time as specified in ITT Clause 20.7.

21.2 BMRCL may, at their discretion, extend the deadline for submission of tenders by issuing an amendment in which case all rights and obligations of BMRCL and the Tenderers previously subject to the original deadline shall thereafter be subject to the new deadline as extended.

**22 Late or delayed Tenders**

22.1 In online e-Procurement Portal, the Tenderer shall not be able to submit the Tender after the last date and time for Tender submission as the icon for the task in the e-Procurement Portal will be disabled.

Hardcopies (as per ITT clause 13.2) received by BMRCL after the deadline for submission as mentioned in ITT clause 20.7 will be rejected.

**23 Modification and Withdrawal of Tenders**

23.1 Tenderer may modify and correct or upload any relevant document in the portal till Tender submission date and time as published in the eProcurement Portal.

23.2 No Tender shall be modified subsequent to the deadline for submission of Tenders.

23.3 Withdrawal or modification of a Tender during the intervening period between the deadline for submission of Tenders and the expiration of the period of Tender validity specified by the Tenderer in the Tender Form will result in forfeiture of Tender Security/EMD pursuant to ITT Clause 16.

## E. TENDER OPENING AND EVALUATION

**24 Tender Opening and Evaluation**

24.1 **Qualification Cum Technical Package:**

24.1.1 Opening of Qualification Cum Technical Package (Technical Bid/Tender) of all Tenders:

Employer will open the Qualification Cum Technical Package (Technical Bid/Tender) of all the Tenders received through e-procurement Portal at the time and date fixed for Technical Bid. Before opening the Technical Bid of a Tenderer, the Employer will verify the EMD first. If EMDs are not in proper form, the technical Bid will not be opened for such tenderers. Interested tenderers or their authorized representatives who choose to attend or may view the same on the portal on the scheduled date and time from their end. In the event of the specified date for Tender opening being declared a holiday by the Employer, the Tenders will be opened at the appointed time and location on the next working day.

24.1.2 The Tenders will be examined for the following submittals:

i. Presence of valid Tender Security / EMD,
ii. Presence of Qualification cum Technical Package and all enclosures as per ITT clause 13.1 and,
iii. Submission of original documents as per ITT clause 13.2.

24.1.3 If any Tender contains any deviation from the Tender documents and /or if the same does not contain Tender Security in the manner prescribed in the Tender documents, then that Tender is liable for rejection. Incomplete Tenders in respect of above would be rejected.

Tenderers whose, Qualification cum Technical Package are found acceptable after evaluation would be informed of the date and time of opening of Financial Package through Portal.

24.2 **Financial Package**

The Financial Package of the Tenderers, whose Qualification cum Technical package were found acceptable, will be opened in the presence of those Tenderers or their representatives, who choose to be present and also can view the opening on e-procurement portal from their end. In the event of the specified date for Financial Package opening being declared a holiday by the Employer, the Tenders will be opened at the appointed time on the next working day.

The Tenderer's name, the Percentage rate (above or below or at par), Tender price, the total amount of each Tender, any discounts, Tender Modifications and Withdrawals, and such other detail as the Employer may consider appropriate, will be announced by the Employer at the opening.

Conditional Tenders are not acceptable and will be summarily rejected. The Employer shall prepare minutes of the Tender opening, including the information disclosed to those present and the minutes shall form part of the Contract.

**25 Process to be Confidential**

25.1 The Tender Invitation Documents and any addenda thereto, together with any further communications, are issued for the purpose of inviting Tenders only. The Tenderer shall not disclose any information contained in the documents or otherwise supplied in connection with this Tender invitation to any third party except for the purpose of preparing its Tender. The Tenderer shall maintain complete confidentiality till the Contract is awarded.

25.2 After the opening of Tenders, information relating to the examination, clarification, evaluation, Tenders and recommendations concerning the award of Contract shall not be disclosed to the Tenderers or any other persons not officially concerned with such process until the award of the Contract to the successful Tenderer.

25.3 Any effort by a Tenderer to influence BMRCL personnel or representatives on matters relating to Tenders under study in the process of examination, clarification, evaluation and comparison of Tenders and in decisions concerning award of Contract, may result in the rejection of the Tenderer's Tender.

25.4 The Tenderer shall undertake that it will treat as confidential all matters arising in connection with the Tender. The documents are issued only for the purpose of preparing and submitting the Tender offer in response to the invitation and not for any other purposes.

**26 Clarification of Tenders**

26.1 To assist in examination, evaluation and comparison of Tenders, BMRCL may ask Tenderers individually for clarification of their Tenders including breakdown of unit rates/prices. The request for clarification and the response shall be in writing, but no change in the price or substance shall be permitted except conforming clarifications sought.

26.2 No Tenderer shall contact the Employer on any matter relating to its Tender from the time of the Tender opening to the time the contract is awarded.

**27 Examination of Tenders and Determination of Responsiveness**

27.1 Prior to detailed evaluation of Tenders, the Employer will determine whether each Tender:

a. Is accompanied by the required Tender Security/EMD,
b. Has been properly signed by an Authorized signatory.
c. Meets qualifying criteria, and;
d. Is responsive to the requirements of the Tender documents.

27.2 For the purpose of this clause, a substantially responsive Tender is one, which conforms to all the terms, conditions and specifications of the Tender documents, without material deviation or reservation. The material deviation or reservation is one which affects in any substantial way the scope, quality or performance of the works, or which limits in any substantial way or is, inconsistent with the Tender documents, BMRCL's rights or the Tenderers obligations under the Contracts and the rectification of which, deviation or reservation would affect unfairly the competitive positions of other Tenderers presenting substantially responsive Tenders.

27.3 If a Tender is not substantially responsive to the requirements of the Tender documents, it will be rejected by BMRCL.

**28 Correction of Errors**

28.1 Tenders determined to be substantially responsive will be checked by BMRCL for any arithmetical errors in computation and summation, Errors will be corrected by BMRCL as follows:

a) Where there is a discrepancy between quoted rate of percentage above or below or at par in figures and in words, the percentage above or below or at par, in words will govern.

28.2 The total Tender price quoted will be adjusted by BMRCL in accordance with the above procedure for the correction of errors and the concurrence of the Tenderer shall be deemed and binding upon the Tenderer. If the Tenderer does not accept the corrected price of the Tender, his Tender will be rejected and will result in forfeiture of the Tender Security / EMD pursuant to ITT clause 16.

28.3 If the Successful Tenderers price, is seriously unbalanced or over priced in the opinion of the Employer, the Employer may require the Tenderer to produce detailed price analysis for any or all items and Sub-heads of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed.

**F. AWARD OF CONTRACT**

**29 Acceptance / Award of Contract:**

29.1 The Employer will award the Contract to the Tenderer, who meets the Eligibility and Qualification Criteria, whose Tender has been determined to be substantially responsive and complete in accordance to the Tender requirements, and whose Evaluated Tender Price is determined to be lowest.

**30 Right to Accept or Reject any or all Tenders**

30.1 BMRCL shall not be bound to accept the lowest or any Tender or to assign reasons for non-acceptance of any Tender. BMRCL reserves the right to accept a Tender either in whole or part.

30.2 BMRCL reserves the right to award the Tender as single Contract or can split into part Contract as desired by BMRCL.

30.3 BMRCL reserves the right to accept or reject any Tender, to annul the Tendering process and reject all Tenders, at any time prior to award of Contract, without thereby incurring any liability to the affected Tenderer or Tenderers or any obligation to inform the affected Tenderer or Tenderers of the grounds for BMRCL action.

**31 Notification of Award**

31.1 Prior to the expiration of the Tender validity, BMRCL will notify the successful Tenderer by cable or Fax or Telex or Email. This letter (hereinafter and in the conditions of Contract called "Letter of Award") shall specify the amount which BMRCL will pay to the Contractor in consideration of the execution, completion, operation, maintenance and guarantee of the works by the Contractor as prescribed by the Contract (hereinafter and in the conditions of Contract called "The Contract price").

31.2 Until a formal agreement is prepared and executed, the Tender together with the written acceptance of the LOA shall constitute a binding Contract between both the parties.

31.3 No further correspondence will be entertained by BMRCL from the unsuccessful Tenderers.

**32 Performance Security / Security Deposit**

32.1 Within fourteen (14) days of issue of the Letter of Award (LOA) by BMRCL, the successful Tenderer shall furnish Security for an amount of **Ten (10) percent of the Contract price** in any one of the following forms to guarantee the faithful performance of the Contract:

a) Demand Draft or Pay Order or Banker's cheque payable at BENGALURU drawn in favour of Bangalore Metro Rail Corporation Limited, on any Indian Nationalized Bank located in India.

OR

b) Bank Guarantee issued by an Indian Scheduled Bank (excluding Co-operative Banks) or from a Scheduled Foreign Bank as defined in Section 2(e) of RBI Act 1934 read with Second Schedule drawn on and payable/Extendable at a designated branch in Bangalore as per the format given in Annexure-C of Section VI.

The Bank Guarantee shall be valid for a period of three (3) months beyond completion of Warranty period.

No interest shall be paid on Performance Guarantee.

32.2 Not used.

32.3 Not used.

32.4 **Additional Performance Security**

After evaluation of the price analysis, taking into consideration the schedule of estimated contract payments, the Employer may require an Additional Performance Security, at the

expense of the successful Tenderer to a level sufficient to protect the Employer against financial loss in the event of default of the successful Tenderer under the Contract, as specified below:

i. If the tender price offered by the successful Tenderer is lower than 10% but up to 20% of the estimated cost, then the additional performance security shall be calculated at 10% of the difference in the:
   (a) Estimated cost (as mentioned in NIT) – 10% of the estimated cost and
   (b) The tender price offered by the lowest evaluated Tenderer.

ii. If the tender price offered by the successful Tenderer is lower than 20% of the estimated cost then the additional performance security shall be calculated at 15% of the difference in the;
   (a) Estimated cost (as mentioned in NIT) – 10% of the estimated cost and
   (b) The tender price offered by the lowest evaluated Tenderer.

If such an additional Performance Security is required by the Employer, the successful Tenderer shall furnish the same, failing which his tender shall be liable for rejection. The additional performance security shall be valid up to contract period in consideration or any extension or issuance of acceptance/taking over certificate whichever is later, and released to the contractor on completion of the work.

**33 Signing of Agreement**

33.1 Within twenty-one (21) days of notification of award of work, the successful Tenderer shall sign the Contract Agreement (Annexure – A of Section - VI) on a stamp paper of requisite value, purchased by him at his own cost.

33.2 Failure to execute the Contract Agreement within the said period may result in termination of Contract and award of the same to other agency/agencies at the risk and cost of the Contractor.

33.3 The Contract agreement shall be signed /executed by the duly authorized person to bind the Successful tenderer by notarized Power of Attorney.

**34 Information Regarding any Relative of Contractor Employed in BMRCL**

34.1 Should a Tenderer or Contractor have a relative employed in Managerial capacity in BMRCL or in case of partnership firm or Company incorporated under the Indian Company Law, should a partner or relative of the partner or a shareholder be employed in responsible position in BMRCL, the authority inviting Tender shall be informed of the fact at the time of submission of Tender. If such fact is suppressed at the time of Tendering and comes to light at any time after the acceptance of Tender, the Contract may be rescinded.

34.2 **Corrupt or Fraudulent Practices:**

34.2.1 The Employer requires that the Tenderers / suppliers / Contractors under this Contract, observe the highest standard of ethics during the procurement and execution of this Contract. In pursuance of this policy the Employer:

a. Defines, for the purpose of these provisions, the items set forth below as follows:

i) "Corrupt Practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in Contract execution; and

ii) "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a Contract to the detriment of the Employer, and includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.

b. Will reject a proposal for award of work if he determines that the Tenderer Recommended for award has engaged in corrupt or fraudulent practices in competing for the Contract in question.

c. Will declare a Tenderer ineligible, either indefinitely or for a stated period of time to be awarded a Contract/ Contracts if he at any time determines that the Tenderer has engaged in corrupt and fraudulent practices in competing for, or in executing the Contract.

34.2.2 BMRCL and each Tenderer submitting the Proposal shall comply with these conditions of Tender and in their dealings with each other, discharge their duties and obligations on time and with integrity and behave equitably, honestly and transparently.

**35 One Tender per Tenderer**

A Tenderer shall submit only one Tender. A Tenderer who submits or participates in more than one Tender will be disqualified. No Tenderer can be a Subcontractor while submitting a Tender in the same Tender process. A Tenderer, if acting in the capacity of Subcontractor in any Tender, may participate in more than one Tender, but only in that capacity.

**36 Miscellaneous**

36.1 The Contractor shall undertake not to enter into Subcontract with any other person or to transfer the Contract or any benefit there under to any person or firm without the prior written approval of BMRCL.

36.2 It is the responsibility of the Tenderer to check the documents on receipt for completeness and notify BMRCL of any discrepancy or omission.

36.3 The Tenderer represents, warrants, and covenants that it will, throughout the term of performance of the Work under this Contract, maintain all required license status, professional ability, skills, and capacity to perform its obligations hereunder and will perform them in accordance with the requirements of the Contract Documents. The Contractor further represents and warrants that it can successfully perform the Work in conformity with Contract Documents and comply with all applicable laws, rules and regulations.

36.4 BMRCL reserves the right to request the Tenderers to make a presentation of their module or mode of carrying out the work and any such presentation shall be made at their own cost, risk and liability.

36.5 It is the responsibility of the successful Tenderer to make his own arrangements for obtaining necessary licenses, permits, clearance, from BESCOM, BBMP, BWSSB, Traffic police, Bharath Sanchar Nigam Ltd, and any other stake holder etc.., except as specified in the Contract.

36.6 Tenderers are required to fill in all the blank spaces in the Form of Tender as per Section V.

36.7 The Tenderers shall be presumed to have carefully examined the drawings if any, conditions and specifications of work & to have fully acquainted themselves with all details at site, locations, materials, geological formations, weather characteristics, labour conditions etc; pertaining to the work.

36.8 The Tenderers shall abide by all rules / acts in force with regard to safety, environment, worker's, transportation, etc. for carrying out the work in safe and efficient manner.

36.9 While all efforts have been made to avoid errors in drafting this tender documents the Tenderer is advised to check the same carefully and seek clarifications within the stipulated period only. No claim on account of any errors detected in the tender document shall be entertained.

36.10 Tenderer shall have adequate erection facilities and capacities. The Tenderer shall have quality assurance plan for procuring of materials, supply, installation, testing and commissioning.

36.11 Tenderd shall be submitted for whole of the works defined in the tender document. Tenders not covering the entire specified scope of work, shall be treated as incomplete and rejected.

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# SECTION – III

# GENERAL CONDITIONS OF CONTRACT (GCC)

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# SECTION – III : GENERAL CONDITIONS OF CONTRACT

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# SECTION – III: GENERAL CONDITIONS OF CONTRACT

**1 Definition of terms**

1.1 In these general conditions, the following expressions shall be the meanings herein assigned to them, unless there is something in the subject or context inconsistent with such meaning.

1.2 **"BMRCL or Employer or Owner or Company or Purchaser"** shall mean the **"BANGALORE METRO RAIL CORPORATION LIMITED"**, which has jurisdiction over the area of works, and its successor if any.

1.3 **"Division"** shall refer to the respective office of BMRCL directly in charge of the works.

1.4 **"Contractor"** shall mean the successful Tenderer whether a firm, registered company, partnership or an individual, whose Tender has been accepted by BMRCL or by the Officer duly authorized on behalf of BMRCL, and who has entered into agreement with BMRCL for due fulfillment of the Contract and shall also include legal representatives, successors and assignees of the Tenders.

1.5 **"Engineer"** means the Officer of BMRCL in charge of the works or such other officer who may be appointed to act as the Engineer for the purpose of this Contract and shall also include the Chief Engineer/ Executive Engineer/ Assistant Executive Engineers or Officers of equivalent rank, directly in charge of the work authorized by BMRCL. The Contractor shall have the right of appeal against the orders of a lower ranked authority to the higher ranked authority of BMRCL whose decision shall be final and legally binding on all parties concerned.

1.6 **"Engineer–in-charge"** shall mean the Engineer of the concerned jurisdiction or his duly authorized officers.

1.7 **"Plant"** shall mean and include any or all plant, machinery, tools or other implements of all description necessary for the execution of the work in safe and workman like manner.

1.8 **"Work or Works"** shall mean the work or works set out and described in the Schedule of prices, drawings and specifications and which the Contractor has agreed to execute under the terms of Contract. It shall include all items of work, which unless specially excluded are necessary to execute the work as described.

1.9 **"Contract and Contract documents"** shall mean and include the General conditions of Contract, Special conditions, Specifications, Schedule of Prices, drawings and the stamped agreement.

1.10 **"Specifications"** shall mean the specifications annexed and such other specifications and the Schedule of drawings if any, as may be detailed and necessary due to particular nature of works wherever applicable i.e. specifications and construction practices published by the BBMP/BESCOM/KPTCL/Rural Electrification Corporation of India shall be applicable.

1.11 **"Site"** shall mean and include all the area in which operations in respect of the works are carried out. These terms shall also include material stacking yard and the area where temporary structures are put up for installing any machinery etc.

1.12 **"Month"** shall mean a month as reckoned by the English Calendar.

1.13 Words used in singular shall also include the plural and vice versa where the context so demands.

1.14 Word indicating one gender includes all gender.

**2 Contractor to inform himself fully**

2.1 The Contractor shall be deemed to have carefully examined the Contract documents and to have visited the site and fully acquainted himself with the conditions of labour, roads, work, climate, rainfall, type of soil etc., prevalent in the area. Any information available with BMRCL regarding the site conditions will be made available to the Contractor, but BMRCL will not accept any responsibility for the accuracy thereof or the inference that may be drawn there from.

2.2 The Contractor shall in writing get necessary clarifications from the Engineer-in-charge in respect of the meaning of any of the conditions set forth in the Contract documents.

**3 Contractor's representative and labour**

3.1 The Contractor under intimation to the Engineer shall employ at least one competent representative with a minimum qualification of Diploma in Electrical Engineering duly approved by the Engineer- in – charge to carry out and supervise the works on behalf of the Contractor. The said representative or any one of such representatives, if there be more than one shall be present at the site during working hours, and any written orders or instructions given to such a representative by the Engineer-in-charge, shall be deemed to have been lawfully given to the Contractor.

3.2 The Contractor shall at all times employ labour of every description as the Engineer-in-charge may deem necessary for securing the proper progress of the works and shall on demand furnish from time to time such returns as may be required of the number and description of unskilled, skilled and supervisory staff actually engaged for the work.

3.3 The Contractor shall furnish the Engineer-in-charge with such reports as he may be required regarding the progress of the works and the organization in connection with the execution of the work.

3.4 The Engineer-in-charge has the right to object to the employment or presence of any representative or other persons or labour employed by the Contractor on the grounds of incompetence, negligence, misconduct and upon such objection being raised, the Contractor shall be bound to remove or cause to remove such person or persons and provide competent substitutes approved by the Engineer-in-charge. The Contractor shall not be entitled to any damage or loss that may be caused by such action of the Engineer-in-Charge.

3.5 **Subcontracting**

The Contactor shall not, without the previous written consent of the Engineer assign or Subcontract his Contract or any part thereof except for minor works. Any such consent given by the Engineer shall not relieve the Contractor from any obligations, duty or responsibility for all or any action of the Subcontractor as if those actions are committed by the Contractor himself.

Any breach of this clause shall entitle the Employer to rescind the Contract and render the Contractor liable for loss or damage arising due to termination.

**4 Works - general information**

4.1 The Contractor shall execute the works on "**TURNKEY BASIS"** which involves broadly the supply and transportation to works site, assembly, erection, testing and Commissioning of lines and equipment, backfilling and consolidation and returning the released materials to the respective stores of BMRCL or the owners of the assets as decided by BMRCL.

4.2 The details of equipment to be supplied, transported, assembled, erected, tested and commissioned in each package are indicated in the Financial Package. The quantities indicated in Schedule of Prices are only approximate & during the execution of the Contract, BMRCL reserves the right to increase or decrease the quantities of items under the Contract in accordance with the conditions of Contract.

4.3 Before finalizing the orders for purchase of materials the Contractor shall undertake survey of the works to be carried out and make a reliable estimate of the actual quantity of each material required for the intended works. The Engineer-in-charge shall arrange to facilitate the Contractor by furnishing the details of the works and route profile etc., as may be required for the purpose, including deputing of BMRCL officers to the extent deemed necessary by him. However, delay if any in this regard shall not constitute a valid ground for delay in completion of works.

4.4 Any other items of work not specifically mentioned, but which are essentially required for satisfactory performance & completeness of the works shall be deemed to be included in the scope of works and the same shall be executed / carried out by the Contractor.

4.5 The whole of the works together with any temporary works associated therewith shall be carried out by the Contractor in a satisfactory and workmanship like manner with the materials and workmanship as specified to the entire satisfaction of the Engineer-in-charge, and in such a manner as the Engineer-in-charge may direct. The Contractor shall attend to and carryout without any delay all orders and instructions which the Engineer-in-charge may issue from time to time.

4.6 The whole of the works shall be executed in strict conformity with the Contract documents and such explanatory, detailed or modified drawings and directions as may be furnished from time to time by the Engineer-in-charge for the guidance of the Contractor.

4.7 In case of any defect in material supplied or the work carried out or both noticed by BMRCL/Contractor during execution of the work or during the period of Performance Guarantee, the Contractor shall replace the defective material and redo the defective work to the satisfaction of Engineer-in-Charge or the authorized officer of BMRCL / BWSSB / BBMP / BESCOM.

4.8 The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Contract Price. The Contract Price shall cover all his obligations under the Contract and all things necessary for the proper execution and completion of the Works, testing and commissioning and remedying of any defects.

4.9 Contractor shall take full responsibility for adequacy of safety and security of the Works. He shall also have full regard for safety of all persons on or in the vicinity of the site.

4.10 The Contractor shall take all reasonable steps to protect the environment and to avoid injury, damage and nuisance to people and property resulting from pollution, noise and other results of his operations. The Contractor shall ensure that air emissions, surface discharges and effluent from the Site during the Contract Period shall not exceed the values prescribed by law.

4.11 It shall be the responsibility of the Contractor to provide at his own expense the required sheds, store houses and yards for execution of the Works and provide free access to the Engineer or his Representative/s who will have right of inspection including that of instructing the Contractor to remove a particular material from the stores and not to use the same on the Works.

**5 Local Conditions**

5.1 It will be imperative for each Contractor/ Tenderer to fully inform himself of all local conditions and factors, which may have any effect on the execution of the works and services covered under these documents and specifications.

5.2 It must be understood and agreed that such factors have properly been investigated and considered while submitting the Tender. No claim what so ever including those for financial adjustment to the Contract awarded under these specifications and documents shall be entertained by BMRCL. Further, no change in the time schedule of the Contract or any financial adjustment (s) arising thereof shall be permitted by BMRCL, which are based on the lack of such clear information.

**6 Drawings**

6.1 Unless otherwise provided for in the Contract, the Engineer-in-charge shall furnish to the Contractor, free of charge copies of drawings, and specifications as may be considered by the Engineer-in-charge to be reasonably necessary for the execution of the work.

6.2 Drawings, specifications and copies thereof furnished by the Engineer-in-charge shall not be used for other works and shall be returned to the Engineer-in-charge, on completion of the works. Drawings, specifications or other Contract documents shall not be reproduced or caused to be reproduced, without the previous written permission of the Engineer-in-charge.

6.3 All the drawings required for execution of work shall be got approved from BMRCL Authorities before execution of work.

**7 Contract includes all necessary operations**

7.1 The Contract includes the whole of the works which are described herein or implied by the Contract documents or which may be inferred to be obviously necessary for the efficiency, stability and completion of the permanent works and the performance of all operations and the supplying of all materials and things described in or implied by the Contract documents or which may be deemed necessary for the completion of the works in all respects to the complete satisfaction of the Engineer-in-charge, shall be deemed to be included in the Contract.

7.2 Works shown upon drawings without being mentioned or described in the specifications or shall nevertheless be held to be included in this Contract in the same manner as if they had been expressly shown upon the drawings and described in the specifications also.

**8 Discrepancy between drawings and specifications**

8.1 In case of errors, omission and / or disagreement between the written and scaled dimensions on the drawings or between the drawings and specifications, the Contractor shall make a reference to the Engineer-in-charge, whose elucidation or decision shall be considered authentic. For any error in the work due to such errors or omissions or disagreements, if he fails to refer them to the Engineer-in-charge, and get elucidation before starting the work, or specific part of the work executed, he shall himself be liable for the consequential losses, if any.

**9 The contractor shall supply and be responsible for the efficiency of the means employed.**

The Contractor shall supply and bear responsibility for procuring all materials, plant, Labour, scaffolding, timbering, machinery, tools and other implements and generally all means required for the `fulfillment of the Contract, whether such means be or not be recommended by the Engineer-in-charge. No materials, plant, tools, tackles or equipment brought to the site for use on the works shall be removed from the site without previous written permission of the Engineer-in-charge.

**10 Watch and ward**

Except as may be specifically provided the Contractor shall be responsible for all proper watch & ward of all works comprised in the Contract & for providing necessary temporary footways & fences etc.

**11 Safety Devices**

The Contractor shall at his own cost provide such safety devices, like steel or fiber glass helmets, slings, ropes, belts, covering for legs and hands, masks, etc., for the safety of personnel and glow tapes, glow signs, barricades, etc., for the safety of public, commuting near the work place. when working underground or in water or when handling cement, or working on steep slopes etc., and as the Engineer-in-charge may direct in the interest of safeguarding the workmen from liability to accidents or damages to health and to carry out such measures as the Engineer-in-charge may prescribe in this behalf. The Contractor shall be responsible for the workmen employed by him or third party in case of accidents or damages resulting in bodily injury or affecting their health and to carry out such instructions regarding preventive or safety measures as the Engineer-in-charge may prescribe on this behalf. The Contractor shall also be solely responsible for the adequacy of the strength and design of scaffolding, gangways, and notice board etc., erected for the execution of the works. All the works shall be in conformity with all the laws prevailing on the land.

**12 Agreement and Performance Security**

12.1 Within a period of **Fourteen** (**14) days** or such other period as may be mentioned in the letter of notification of award of the Tender, the Successful Tenderer shall furnish the required Performance Security and shall enter into an Agreement with BMRCL within Twenty-one (21) days of Notification of Award of works according to the conditions of the Contract on Karnataka Government Stamp paper of requisite value as per the format enclosed at Annexure-A. The cost of the stamp duties and similar charges imposed by law shall be borne by the contractor.

12.2 Performance Security is a deposit with BMRCL of an amount equal to **Ten (10) percent of the Contract Price.** The Performance Security shall be in the form of:

a) Demand Draft or Pay Order or Banker's cheque payable at Bengaluru drawn in favour of Bangalore Metro Rail Corporation Limited, on any Indian Nationalized Bank located in India.

OR

b) Bank Guarantee issued by an Indian Scheduled Bank (excluding Co-operative Banks) or from a Scheduled Foreign Bank as defined in Section 2(e) of RBI Act 1934 read with Second Schedule drawn on and payable/Extendable at a designated branch in Bangalore as per the format given in Annexure-C of Section VI. The Bank Guarantee shall be valid for three (3) months beyond the date of completion of Warranty period.

12.3 Failure of the successful Tenderer to furnish the required Performance Security shall be a ground for the annulment of the award of Contract and forfeiture of the Tender Security / EMD pursuant to ITT clause 16.

12.4 The whole or such portion of the Performance Security amount as he may consider fit shall be liable to be forfeited by the Employer at the discretion of the Employer, in the event of any breach of Contract on the part of the Contractor.

12.5 In the event of variations during the execution of the Contract which result in payments to the Contractor over and above the original Contract Price, the Performance Security shall be suitably adjusted every 6 months at the request of the Employer.

12.6 All expenses incurred for completing and stamping the Contract Agreement shall be borne by the Contractor. The stamped Agreement shall be deposited with BMRCL and a copy of the Agreement signed by both parties shall be delivered to the Contractor.

12.7 After the Tender has been accepted by BMRCL or by any Officer duly authorized by BMRCL to accept the Tender, all orders and instructions to the Contractor, except as herein otherwise provided, will be given by the Engineer-in-charge, on behalf of BMRCL.

12.8 In case the validity of the Bank Guarantee for performance of Contract is to be extended for any reason, the Contractor shall get the validity extended and the cost of which shall be borne by the Contractor.

12.9 The Performance Security shall be released after completion of the entire work, commissioning, handing over and completion of all Contractual obligations including Warranty period, whichever is later.

**13 Liability for accidents to persons**

13.1 The Contractor shall be solely responsible for all accidents to persons employed by him, which may arise in the execution of the works, and from whatever cause they may arise during execution and maintenance of works included in the Contract and shall arrange for insurance as prescribed in the Tender document.

13.2 The Contractor shall indemnify BMRCL against all action, suits, claims, demands, cost of expenses arising in connection with injuries suffered upto the date when the works or plant shall have been taken over under and of the clauses herein by persons employed by the Contractor or his Subcontractor whether under the general law or under the Employee's compensation Act or any other statute in force on the date of the Contract dealing with the question of the liability of employee from injuries suffered by employees and to have taken steps properly to ensure against any claims there under.

13.3 On the occurrence of accidents which result in the death of the workmen employed by the Contractor or which result in injury so serious as to be likely to result in the death of any such workmen, the Contractor shall within 24 hours of happening of such accident, intimate in writing to the concerned Engineer-in-charge, the details of such accidents. The Contractor shall indemnify BMRCL against all loss or damages sustained by BMRCL resulting directly or indirectly from Contractors failure to give intimation in the manner aforesaid or otherwise to confirm to the provision of the Employee's compensation Act, in regard to such accident. In the event of any claim being made or action brought

against BMRCL due to negligence of the Contractor and arising out of the matter there of the Engineer in-charge of BMRCL shall assist, if so required, but at the sole expense of the Contractor, and, he may conduct all negotiations for the settlement of the case or any litigation that may arise there from. In such cases, BMRCL shall at the expense of the Contractor extend all available assistance for any such purpose.

13.4 In the event of any accident in respect of which compensation may become payable under Employee's Compensation Act, whether by the Contractor or by BMRCL as Principal, it shall be lawful for BMRCL to retain out of money due and payable to the Contractor such sum or sums of money as may be in the opinion of the said Engineer-in-charge, sufficient to meet such liability. Any balance left out of money so retained after meeting such liability shall be refunded to the Contractor.

13.5 The Contractor shall at all times indemnify BMRCL against all claims for damages or compensation under the provisions of payment of Wages Act – 1936, Minimum Wages Act -1948, Employers Liability Act – 1938, the Employee's Compensation Act – 1923, Industrial dispute Act – 1947, Indian Factories Act- 1948, Contract Labour Act – 1970, Maternity Benefit Act – 1961 or any modifications thereof made therein from time to time.

13.6 The Contractor shall bear the liability of all the risks and insurance and BMRCL shall not be responsible for any liabilities, whatsoever in any way.

13.7 The Contractor shall deliver the policies / Certificates of Insurance to the Engineer-In-charge for approval before commencing the work.

**14 Liability for damage to works or plant**

14.1 The Contractor shall during the progress of the works properly cover up and protect the work place and plant leased by BMRCL from injury by exposure to weather and shall take every reasonable proper and timely precautions against accidents or injury to the same from any cause, and shall be answerable and liable for all accidents or injuries resulting there from or occasioned by the Acts or omissions of the Contractor or his workmen or Subcontractor and shall indemnify the employer for all losses and damages to the works or plant arising from such accidents or injuries.

**15 Labour conditions**

15.1 The Contractor shall comply with the labour laws in force and shall furnish the returns and information as may be specified from time to time. He shall not employ or engage migrant labourers without express permission of the Engineer- in- charge.

15.2 The Contractor shall as far as possible obtain his requirements of labour from the local area, and through the employment exchanges wherever so required by law. The Contractor shall pay fair and reasonable wages as prescribed under Minimum wages Act 1948 (whether or not such wages are controlled by any law existing at the time) to workmen employed by him for the work

15.3 The Contractor shall provide at his own cost, suitable shelters at the work spot for meals and arrange for supply of clean, safe, potable water to his workmen. Where women are employed in numbers more than 50 at a spot, the Contractor shall arrange for "Crèches". The Contractor may be permitted, if he finds it necessary, to work on Sundays subject to the provisions of labour Act with the prior consent of the Engineer-in-charge and after giving the intimation at least two days in advance.

**16 Medical facilities for labourers**

16.1 The Contractor shall arrange to build at his own cost proper camp for his labourers and provide such camps with facilities of clean potable treated water and light (where ever possible) and arrange for drainage and proper disposal of sewage. He shall abide by the rules framed on this behalf by the Engineer-in-charge or the Health Office / Environment officer on the project.

16.2 The Contractor shall also provide at his own cost for the Medical supervision of his workmen against epidemics & arrange for taking anti malaria measures, vaccination against small pox, typhoid, cholera, etc., and examination of persons employed.

16.3 The Contractor shall also at his own cost provide for first aid at the work spot and for medical aid at his main camp to all his employees as directed by the Health Officer / Environment Officer and submit reports regarding such conditions in the camps.

**17 Materials, workmanship etc.,**

17.1 The work shall be executed in a thoroughly standard manner with materials and workmanship of the best quality and strictly in accordance with the specifications and drawings or written instructions as may from time to time be furnished to the Contractor and shall be completed in every respect with all materials and workmanship implied and necessary according to the fair interpretation and meaning of the same. Should there be any discrepancy between the drawing and specifications or any difference or dispute as to the dimensions to be worked to or the periodical quantity to be executed or with respect to any subject arising out of this Contract, the decision of the Engineer-in-charge shall be final and binding on all parties.

**18 Material Procurement:**

The Contractor shall procure the materials from BWSSB/BBMP/PWD/BESCOM/ KPTCL/BMRCL approved vendors only conforming to the Guaranteed Technical Specifications/Parameters as laid out by BMRCL/BWSSB/BESCOM.

**19 Contractor to inform engineer-in-charge the arrangements made by him for the execution of work.**

19.1 The Contractor shall furnish schedule of work and the CPM/PERT chart in / MS Project for carrying out the work and the same shall be followed during execution.

19.2 The Contractor shall furnish the Engineer-in-charge a statement in writing of the arrangements he proposes to adopt for the execution of the work and in case the Engineer-in-charge considers any alterations in the same desirable, the Contractor shall on notice thereof adopt such alteration.

19.3 The Engineer-in-charge and his authorized assistants or agents shall have, at all times, full power to inspect the works wherever in progress either on the site, or at the Contractor's premises wherever situated on the premises of any firm or company where work in connection with this Contract may be done and the Contractor shall provide all reasonable facilities and safety devices, at his own cost, for enabling such an inspection of works to be carried out, and any tests to be conducted if necessary. The Contractor shall maintain at such work spot a Work Order book, in which the instructions in the

said Work Order, shall be promptly noted and sent to the inspecting Officer and provide a copy of the same to the Engineer-in-charge.

**20 Opening out of the works**

Should the Engineer-in-charge consider it necessary in order to satisfy himself as to the quality of work, the Contractor shall at any-time during the execution of the work, pull down or cut into any part of the work and make such openings into and to such an extent through the same as the Engineer-in-charge may direct and the Contractor shall make good the whole of Work at his own cost.

**21 Removal of imperfect work**

21.1 If any work has been executed with unsound, imperfect for unskilled workmanship or with materials of any inferior quality not in accordance with the specifications and drawings, the Contractor shall at his own cost rectify, reform, remove and reconstruct the same either in whole or part as may be directed by the Engineer-in-charge, whether or not the value of any such work (or materials) shall have been included in any payment made to the Contractor.

21.2 Should the Engineer-in-charge consider in his unfettered discretion that he could accept a work which is not strictly in accordance with the Contract documents but is structurally sound and would serve the purpose for which it is executed, he may fix a price less than that Contracted for, and his decision regarding the acceptance and the reduced price to be paid for, shall be final and binding on the Contractor.

**22 Suspension of work**

22.1 The Engineer-in-charge may from time to time by direction in writing without in any way vitiating the Contract, direct the Contractor to suspend the works or any part thereof at such time or times and so long as the Engineer-in-charge may deem desirable, and the Contractor shall not after receiving such written notice proceed with the works therein ordered to be suspended until he shall have received a written notice or authority from the Engineer-in-charge to proceed with the works.

22.2 Should the works be ordered to be suspended directly or indirectly as a result of the Contractor not complying with any of the provisions of the Contract in respect of the quality of the materials, workmanship, progress, mode of execution, the order of execution etc., or in the interest of safety of the works, or due to acts of nature, force majeure or war, the Contractor shall not be entitled to claim any compensation for any loss he may be put to. If however, the works be ordered to be suspended for reason for which the Contractor is not responsible directly or indirectly he will be entitled to compensation as may be determined by the Engineer-in-charge whose decision in the matter shall be final. In such matters the profits that the Contractor would have earned had the work not been suspended shall not be taken into consideration.

**23 Access to site and work on site**

23.1 BMRCL may, if it deems fit from time to time, enter upon any land which may be in the possession of the Contractor under this Contract for the purpose of executing any works by itself or through its agents or through the other Contractors or workers of BMRCL at its option, and the Contractor shall in accordance with the directions of the Engineer-in-charge afford all reasonable facilities for the execution of the works, including the Occupation of lands by structures or otherwise for any Contractors or their workmen or for BMRCL- workers who may be employed in the execution of Works, on or near the site of work not included in this Contract or any Contract in connection with or

ancillary to such work and in default the Contractor shall be liable to compensate BMRCL for any delay or expense incurred by the reason of such default. Provided always that if the exercise of these powers, shall cause any damage to the Contractor he may as and when damage shall arise make a statement of the same to the Engineer-in-charge who shall from time to time certify to BMRCL, the value in his judgment of such damage & BMRCL shall from time to time pay the Contractor the amount if any so certified by the Engineer-in-charge.

**24 Deviations, alterations etc., in the works**

24.1 The Contractor shall not in any way alter any part of the work in respect of design, quantity, material or specification, without the written consent of the Engineer-in-charge, but the Engineer-in-charge may from time to time or at any time during the progress of the works direct in writing any deviations, addition, omissions, or alterations, to be made in or to the works or any part thereof in respect of quantity, design, material, workmanship and or specifications and may direct the Contractor to curtail or omit any of the works or to commence and execute any new or substituted work in such order and manner as he may deem fit and any such direction of the Engineer-in-charge and any such deviation alteration, addition and omissions made in pursuance thereof shall not violate the Contract or be made the ground for any claim for compensation for alleged loss or profit in respect of omitted works or for extra rate of payment for additional works.

24.2 In the event of any disputes arising out of the validity of the claims or as to the amount to be paid or allowed in respect thereof, the decision of the Engineer-In-Charge shall be final and binding and in the mean while the Contractor shall either proceed with or stop the works as may be ordered by the Engineer-in-charge.

**25 Measurement and terms of payments**

25.1 The Contractor shall submit an invoice / Bill in quadruplicate (4 copies) to the Engineer-in-charge in prescribed form. Such Payment will be made after item wise measurements for different works as recommended by the Engineer-in-charge as per the Contract.

25.2 The payments to Contractor are subject to recoveries, which are due from the Contractor as indicated in Clause 26.7 of this section.

25.3 The authorized representatives of the Engineer-in-charge and the Contractor shall jointly take the measurements. The representative of the Engineer-in-charge will give a week's notice to the Contractor of his intention to record the measurement immediately on report of completion of all works by the Contractor and if the Contractor's representative fails to join the Engineer-in-charge representative, the latter may proceed with the measurements by himself and the Contractor shall have to accept these measurements as correct and binding on him.

25.4 On the basis of these joint measurements, payment will be made to the Contractor by the Engineer-in-charge according to the procedure prevalent in BMRCL and as far as possible within **28 working days** after submission of the bills & after recording the measurements as stated above.

25.5 Wherever approval of the Inspectorate authorities is required under statute, payment shall be made by the Contractor and reimbursed by BMRCL on production of bills/vouchers.

25.6 All materials and work for which payment is made in part or full shall become the sole property of BMRCL, but this provision shall not relieve the Contractor of his responsibility for the care and protection of the materials and works at his own cost and his liability to make good the damage if any

unless and until the whole work is deemed to have been completed, commissioned and handed over to BMRCL, in accordance with the terms and conditions of the Contract.

25.7 The periodical measurements and payments will not entitle the Contractor to any claim that the works for which payment has been made are accepted as complete in accordance with the specifications, drawings or other Contract documents and in no way will curtail the right of the Engineer-in-charge to subsequently direct the removal of imperfect work or pay at a lower reduced rate, or to re-measure the works.

25.8 These periodical payments shall be treated only as advance on account to be adjusted finally after the works are finally measured on completion and the final bill is prepared.

25.9 The Contractor shall not be entitled to claim any interest upon any arrears or upon any balance, which may be found due to him at any time.

25.10 **Stages of payment:**

Compensation for items shall include for all costs incurred in procurement/ manufacture, testing, inspection, shipping, hauling, off-loading, storing at site in Bangalore, installation, testing and commissioning including integrated testing and commissioning. Prices so assigned in the BOQ, for supply and installation of items of materials, plant and equipment shall be full compensation for supply and installation of items of materials, plant and equipment in accordance with drawings and specifications, Payment towards supply and installation will be made after receipt of items of materials, plant and equipment to the Contractor's depot (in the land provided by BMRCL) in Bangalore and storing them in a place and manner approved by the Engineer and submission of the following documents:

(i) Certificate of type tests
(ii) Certificate of Factory Acceptance Testes;
(iii) Certificate of inspection by the Engineer
(iv) Proof of Insurance
(v) Technical literature and equipment manual;
(vi) Packing list; and
(vii) Joint record of measurement in approved format, on the following basis;

a) 70% payment on supply of materials, 20% of payment for installation and balance 10% of payment on completion of integrated testing, commissioning, submission of all test reports, other documentation including as-built drawings, guarantee warranty certificates, manuals etc. for
   (i) Pipes and
   (ii) Valves

b) 60% payment against supply of material, 30% payment against installation and balance 10% price so assigned for testing and commissioning of items of materials, plant and equipment is tested and commissioned successfully including integrated testing and commissioning and submission of all test results, other documentation including as-built drawings, manuals, etc., as described in the specifications, have been approved by the Engineer.

c) Payment will be made in RA bills as part payments duly certified by BMRCL for receipt of materials in good condition and correct quantity.

d) Original invoice voucher to be verified by BMRCL and copy to be enclosed with RA bills.

e) Security & Safety of material brought to the site will be sole responsibility of contractor till the completion of corresponding work and handing over to BMRCL.

**26 Taxes and duties**

26.1 Contract prices shall be inclusive of all applicable taxes, duties and cess including taxes to be deducted at source, insurance and exclusive of SGST and CGST. BMRCL shall pay the output SGST and CGST as applicable as per laws.

26.2 Income tax and other statutory deductions of the State & Central Government as applicable from time to time shall be made from the Contractor's Bills & directly remitted to concerned department by BMRCL. If the income tax is to be deducted at lower rate, then the Contractor has to furnish a lower deduction certificate issued by the jurisdictional IT authorities.

26.3 The Contractor shall maintain complete records in respect of payments made by them as required by law.

26.4 The Contractor shall furnish along with the 2nd and subsequent bills copies of all the purchases of Goods and Services made within the State of Karnataka.

26.5 BOCW cess at the rate of 1% of the Total Bill Amount as per "The Building and Other Construction Workers Cess act 1996" shall be deducted from each interim Payment Certificate (IPC) of the Contractor.

26.6 **NOT USED**

26.7 **Recoveries**

26.7.1 Recoveries due from the Contractor up to the end of the month previous to the one in which bill is prepared shall be made from the bills approved for payment every month in the following order of priority and extent.

a) Penalty, in full, if any to be levied.

b) Expenditure incurred by BMRCL on behalf of the Contractor in full.

c) Charges for services such as water supply, power etc., if any, rendered by BMRCL in full.

d) Statutory deductions like Income Tax etc;

e) Any recoveries or other sums due from the Contractor to BMRCL.

26.7.2 The extent of recovery to be made from the Contractor's bill may be modified at the discretion of the Engineer-In-Charge, if the bill under question includes items whose rates are not finalized or the rate for such items is not fully collected.

**27 Date of completion**

27.1 The works shall be completed in all respects within the period specified in Appendix to Form of Tender (Section V) including monsoon period.

27.2 The necessary PERT Chart duly indicating the completion of each stage of work on Individual sections and the total completion period according to delivery schedule shall be furnished, to the Engineer-in-charge.

27.3 The Contractor shall supply, erect, equip and construct the whole of the works to the satisfaction of authorities with all certification and hand them over to BMRCL O&M on or before the date or dates specified as incorporated in the Contract Agreement. Provided always that if, in the opinion of the Engineer-in-charge, any alteration, addition, subtraction or modification of the work due to any strike or lockout of any workmen employed by the Contractor or by causes directly due to war or the unforeseen acts of nature or due to actions caused by BMRCL by issuing any orders, drawings, instructions or directions in time or by the suspension of work, the Engineer-in-charge, if in his discretion deem fit, either forthwith or at any later time and from time to time not withstanding that the prescribed or extended time for completion has expired or that the works have been completed, by writing extend the time for the completion of the work to such date as he may deem fit and proper, provided always that the Contractor makes a written application to the Engineer-in-charge at or before the time when the cause of the delay is occurring or about to occur or within three days from the occurrence of such delay. Unless the time is extended by the Engineer-in-charge, the prescribed time may not be extended not withstanding delays from the foregoing or any other cause of whatever kind. However, the Contractor shall not be responsible for delay due to accordance of approval by the Inspectorate. In such a case, where the Contractor is entitled for the extension of time, no monetary claims whatsoever shall be paid or entertained on this account.

27.4 The Employer shall give possession of all parts of the site progressively for the completion of works to the contractor, if, possession of part of the site is not given by the date stated in the contract or Notice to proceed / LOA, the reasonable extension of time may be given. However, no monetary claims whatsoever shall be paid to the contractor or entertained on this account. The delay in access to site shall not be considered as “Breach of Contract”.

**28 Progress of work and failure to abide by the programme of work and penalties thereof**

28.1 The time allowed for carrying out the work as per program shall strictly be observed by the Contractor as set out in the Tender document / agreement. The work shall throughout the stipulated period of Contract proceed with all due diligence, time being deemed to be the essence of the Contract on the part of the Contractor. If the Contractor at any stage of the progress fails to complete the work, the Engineer-in-charge shall be at liberty to adopt any one of the following courses after sending written notice to the Contractor.

28.2 To employ labour paid by BMRCL, to supply materials to carry out the work or any part of the work, debiting the Contractor with the cost of labour, transportation, price of materials etc., (as to the correctness of such cost and price, the decision of the Engineer-in-charge being final & conclusive against the Contractor) and crediting him with the value of work done in all respects in the same manner and at the same rates as if it has been carried out by the Contractor under the terms of his Contract and in that case, certificate of the Engineer-in-charge as to the value of the work done being final and conclusive against the Contractor.

28.3 In case the Contractor abandons the work or does not execute the work as per the Contract conditions, BMRCL would get the works executed by another agency at the "risk and cost" of the Contractor.

28.4 In order for the work of the Contractor to be measured and to take such part, thereof, as shall be unexecuted out of his hands and to give to another Contractor to complete the same in which any expense which may be incurred in excess of the same, which would have been paid to the original Contractor, if the whole work had been executed by him (as to the amount of which excess expenses, the decision of the Engineer-in-charge shall be final and conclusive ) shall be deducted from any money due to him by BMRCL under the Contract or otherwise from his Earnest Money, further Security Deposit etc.,

28.5 To allow the original Contractor to continue the work, levying the penalty as per rates noted below for the number of days that the Contractor takes to complete and deliver portion of the work which was scheduled to be completed as per program in the agreement.

**29 Penalty for delay in execution of the work**

29.1 The penalty shall be one (1) percent of the Original Contract Price per week of delay or part thereof subject to a maximum of 10% on the portion of work which is not completed for beneficial use within the time stipulated in clause 27 above.

a) The period(s) of continuance of delay, if any, beyond 10 weeks shall be at the sole discretion of the Engineer-in-charge. If the Contractor still fails to complete the work within such extension period, the Contractor shall be liable for paying the liquidated damages/penalty as decided by BMRCL.

b) Penalties levied for the following:

(i) Non-fulfillment of program of works within the stipulated period.

(ii) The number of days allowed beyond the stipulated period for completing the work and

(iii) Extra cost that might be incurred by BMRCL for getting the balance work completed through any other agency as it deems fit under the circumstances will be deducted from money due to him by BMRCL for work done under the Contract or otherwise.

c) The levy of penalty is however exempted, if extension of time granted for the execution of work for valid reasons.

**30 Compliance with instructions**

30.1 If the Contractor fails to work with diligence and expedition, or shall refuse or neglect to comply with any reasonable orders given to him in writing by the Engineer-in-charge in connection with the work or contrivances of the provisions of the Contract, BMRCL may give "seven days" notice in writing to the Contractor, to make good the failure, neglect or contravention complained of, and should the Contractor fail to comply with the notice within the specified time from the date of service thereof in the case of a failure, neglect or contravention, capable of being made good within that time or otherwise within such time as may be reasonably necessary for making it good, then and in such case BMRCL shall be at liberty to employ other workmen and forthwith perform such work as the Contractor may have neglected to do or if BMRCL shall deem fit it, shall be lawful to take over the work wholly or in part of the Contractor's hands and reconstruct the work or any part and in that event,

BMRCL shall without being responsible to the Contractor for the fair wear and tear of the same have the free use of all the materials, tools, tackle, construction plant or other things for use at any time in connection with the work to the exclusive of any right of the Contract over the same and BMRCL shall be entitled to retain and apply any balance amount which may be otherwise due on the Contract to the Contractor including Earnest Money, Security Deposit and retention money, if any, for the performance of the Contract, or such part thereof as may be necessary to the payment of the cost of executing such work as aforesaid.

**31 Powers to take over plant and equipment to enforce progress**

31.1 Notwithstanding anything contained in the clause herein above, if the Contractor fails to work with due diligence and speed or refuses or neglects to comply with any lawful and reasonable orders given to him in writing by the Engineer-in-charge or contravenes any of the provisions of the Contract, the Engineer-in-charge may give seven days' notice in writing to the Contractor to make good the failure, neglect or contravention complained of and should the Contractor fail to comply with the notice within the time specified in the notice, then in case the Engineer-in-charge shall be at liberty to employ other workmen and forthwith perform such work as the Contractor may have neglected to do, or if deemed fit, it shall be lawful for the Engineer-in-charge to take the work wholly or in part, out of the Contractors' hands and reconstruct it at a reasonable price with any other person or persons or provide any other materials, tools and tackle or labour for the purpose of completing the work and in such an event the Engineer-in-charge shall without being responsible to the Contractor for fair wear and tear, have the free use of all materials, tools, tackle, plant or other things including operating personnel which may be on the site for the use at any time in connection with the work to the exclusive of the right of the Contractor, over the same and the Engineer-in-charge shall be entitled to retain and appropriate and balance which may otherwise be due to the Contractor as may be necessary to the payment of the cost of executing such works aforesaid.

31.2 If the cost of executing the work as aforesaid exceeds the balance due to the Contractor and the Contractor, fails to make good the deficit, the said materials, tools, tackle, plant or other things, which were the property of the Contractor, may be sold by the Engineer-in-charge and the proceeds thereof applied towards the payment of such difference and cost of any incidental to such sale, shall be paid by the Contractor forthwith but when all expenses, costs and all charges incurred in the completion of the works are paid by the Contractor, all such materials, tools, tackle, construction plant or other things, remaining unsold may be allowed to be removed by the Contractor**.**

**32 Termination of contract**

32.1 BMRCL shall have the powers:

a) To recover from the Contractor as agreed liquidated damages or by way of penalty clause above and to purchase elsewhere/complete the works after giving due notice to the Contractor, on to the account and at the risk of the Contractor, such stores/works not so delivered/completed or others of a similar description without canceling the Contract in respect of the consignment/work not yet due for delivery, but the Supplier/Contractor shall not be entitled to any savings on such purchases/works made against default.

b) To cancel the Contract.

c) To forfeit Performance Security.

d) To blacklist or not to consider the Contractors future offers for a specified period or such other periods as decided by BMRCL.

32.2 **Termination for Convenience**

32.2.1 BMRCL may, by a written notice of 14 days sent to the Contractor, terminate the Contract, in whole or in part at any time for its convenience. The notice of termination shall specify the termination is for BMRCL's Convenience, the extent to which performance of work under the Contract is terminated and the date upon which such termination is effective.

32.2.2 The Contractor upon receipt of such notice shall discontinue the work on the date and to the extent specified in the notice, make all reasonable efforts to obtain cancellation of all orders and the Subcontracts to the extent they are related to the work terminated and upon terms satisfactory to BMRCL.

32.2.3 After termination, the Employer (BMRCL) may complete the works and arrange for any other entities to do so at the risk and cost of the Contractor. The Employer and his entities then may then use the working area, Contractors documents and his any other related documents made by or on behalf of the contractor.

On termination of the Contractor's default, the Employer shall be entitled to:

a. Forfeit the whole or such portion of the Performance Security amount as it may consider fit, and

b. Recover from the Contractor the cost of carrying out the balance work in excess of the sum which he would have been paid according to the certificate of the Engineer, if the works had been carried out and completed by the Contractor under the terms of Contract. Such certificate shall be final and binding upon the Contractor. The amount to be recovered may be deducted by the Employer from any monies then due or which, at any time thereafter, may become due to the Contractor under this or any other Contract or otherwise.

**33 Force majeure**

33.1 For the purposes of the Contract "Force Majeure" means, an event which could not reasonably have been avoided by a diligent party in the circumstance, which is beyond the reasonable control of a party and which makes the performance of an obligation as to impossible in the circumstances and includes, but is not limited to, war, riots, civil disorder, earthquake, storm, flood or other adverse weather conditions strikes, lockouts or other industrial action, Electrical Grid failure, confiscation or any other action by Government agencies.

33.2 Force majeure shall not include any event, which is caused by the negligence or intentional action of a party or such party's Subcontractors or agents or employment, or by a failure to observe good Engineering practices.

33.3 Force Majeure shall not include insufficiency of funds or failure to make any payment required hereunder.

**34 Completion & final certificate**

34.1 As and when the whole work is completed to the satisfaction of the Engineer-in-charge in accordance with the conditions of this Contract, the Engineer-in-charge shall issue a Completion Certificate and the Engineer-in-charge shall take over the work included in the completion certificate.

34.2 The Contract shall not be considered as complete until a final certificate is issued by the Engineer-in-charge, to the effect that the Contractor has fulfilled all the obligations in the manner provided in the Contract not withstanding any previous entry on the works or taking possession of works or using any part of the work by BMRCL. Final completion certificate shall be issued within one month soon after handing over of completed work and return of all the released material to BMRCL, physical completion/Commissioning of the work and submission of final as built drawings by the contractor duly attested by BMRCL Engineer In-charge.

**35 Guarantee of works**

35.1 For a period of Twelve (12) months from the date of issue of the completion certificate herein above mentioned, the Contractor shall be liable for the works or any portion thereof found to be defective for causes arising from faulty materials or workmanship or other causes for which in the judgment of BMRCL/BWSSB, the Contractor is responsible. He shall make good any damages arising there from, notwithstanding the fact that the completion certificate may have been issued and the security deposit refunded.

**36 Death, bankruptcy etc.**

36.1 If the Contractor dies or becomes bankrupt or being a firm commences winding up except for reconstruction purposes or carries on its business under a receiver, the executors, successors or other representatives in law, the liquidator or any person in whom the Contract may become vested, shall forthwith give notice thereof in writing to the Engineer-in-charge and shall take all reasonable steps to prevent stoppage of works for one month during which period he shall guarantee as the Engineer may require but not exceeding the period of option in the event of stoppage of works, the period of option shall be fourteen days only. Provided that, should the above option not be exercised, the Contract may be terminated by the Engineer and any money pending with BMRCL may be forfeited, except in case of termination caused by the death of the Contractor.

**37 Insurance**

37.1 The Contractor at his Cost shall arrange, secure and maintain all Insurance as may be pertinent to the Works and obligatory in terms of law to protect his interest and interests of the Owner against all perils detailed herein. The form and the limit of such Insurance as defined herein together with the under-writer in each case shall be acceptable to the Owner. However, irrespective of such acceptance, the responsibility to maintain adequate Insurance Coverage at all time during the period of Contract shall be of Contractor alone. The Contractor's failure in this regard shall not relieve him of any of his Contractual responsibilities and obligations. The Contractor shall, however, be authorized to deal directly with Insurance Company or Companies and shall be responsible in with regard to maintenance of all Insurance covers. Further the Insurance in Indian Rupees.

37.2 Any loss or Damage to the Equipment during handling, transportation, Storage, Erection, putting into satisfactory operation and all activities to be performed till the successful completion of Commissioning of the Equipment shall be to the account of the Contractor. The Contractor shall be responsible for preference of all Claims and make good the Damages or loss by way of repairs and/or replacement of the Equipment, Damaged or lost. The transfer to title shall not in any way relieve the Contractor of the above responsibilities during the period of Contract. The Contractor shall provide the Owner with copy of all Insurance policies and Documents taken out by him in pursuance of the Contract. Such copies of Documents shall be submitted to the Owner immediately after such Insurance coverage. The Contractor shall also inform the Owner in writing at least sixty (60) Days in advance regarding the expiry /cancellation and/or change in any of such Documents and ensure revalidation, renewal etc., as may be necessary well in time.

37.3 The perils required to be covered under the Insurance shall include, but not be limited to fire and allied risks, miscellaneous accidents (Erection risks) Workman compensation risks, loss or damage in transit, theft, pilferage, riot and strikes and malicious damages, civil commotion, weather conditions, accidents of all kinds, etc. The Scope of such Insurance shall be adequate to cover the Replacement/ Reinstallation Cost of the Equipment for all risks up to and including delivery of Goods and other Costs till the Equipment is delivered at Site. The Insurance policies to be taken should be on replacement value basis and/or incorporating escalation Clause. Notwithstanding the extent of Insurance cover and the amount of Claim available from the underwriters, the Contractor shall be liable to make good the full replacement/ rectification value of all Equipment/Materials and to ensure their availability as per Project requirements.

37.4 All Costs on account of Insurance liabilities covered under the Contract will be on Contactor's account and will be included in Contract Price. However, the Owner may from time to time, during the pendency of the Contract, asks the Contractor in writing to limit the Insurance coverage, risks and in such a case, the Parties to the Contract will agree for a mutual settlement, for reduction in Contract Price to the extent of reduced Premium amount. The Contractor, while arranging the Insurance shall ensure to obtain all discounts on Premium that may be available for higher Value or for reason of financing arrangement of the Project.

**38 Jurisdiction of court in case of dispute or differences arising on account of this tender**

Any suit or application, arising out of any dispute or differences on account of this Tender, shall be filed in a competent court at Bangalore only and no other court or Forum or Tribunal shall, have any jurisdiction in the matter.

**39 Penalty for offering illegal gratification to BMRCL employees**

If the Contractor or any of his servants or agents, directly or indirectly gives promise or offers any bribe, gratuity, gift, loan, perquisite, reward or employment of BMRCL or in any other way directly or indirectly tries to influence the action of such an employee, in any way relating to his office or employment, the Contract shall be liable to be rescinded. In the event of the Contract being rescinded, the Security deposit of the Contract shall stand forfeited to BMRCL and further the work remaining unexecuted shall be carried out at the cost and risk of the Contractor. Such Contractor will be blacklisted and will not be permitted to participate in any future Tenders of BMRCL.

**40 Breach of the part of BMRCL not to affect the contract**

Breach or Non observance of any of the conditions or terms of the Contract by **BMRCL**, shall not entitle the Contractor to rescind the Contract, but he shall only be entitled to claim damages for loss incurred by him in accordance with law.

**41 Law and language**

The Contract shall be governed by the Acts and Laws of India, the rules, regulations and bye-laws of the concerned public bodies and authorities. Language of the Contract shall be English.

**42 Corrupt or fraudulent practices**

42.1 The Employer requires that the Tenderers / Suppliers / Contractors under this Contract, observe the highest standard of ethics during the procurement and execution of this Contract. In pursuance of this policy the Employer:

a) Defines, for the purpose of these provisions, the items set forth below as follows:

i. "Corrupt Practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in Contract execution; and

ii. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a Contract to the detriment of the Employer, and includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.

b) Will reject a proposal for award of work if he determines that the Tenderer Recommended for award has engaged in corrupt or fraudulent practices in competing for the Contract in question.

c) Will declare a Tenderer ineligible, either indefinitely or for a stated period of time to be awarded a Contract/ Contracts if he at any time determines that the Tenderer has engaged in corrupt and fraudulent practices in competing for, or in executing, the Contract.

42.2 BMRCL and each Tenderer submitting the Proposal shall comply with these conditions of Tender and in their dealings with each other, discharge their duties and obligations on time and with integrity and behave equitably, honestly and transparently.

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# SECTION - IV

# SPECIAL CONDITIONS OF CONTRACT (SCC)

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# SECTION-IV - SPECIAL CONDITIONS OF CONTRACT (SCC)

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# SECTION – IV: SPECIAL CONDITIONS OF CONTRACT (SCC)

This Special Conditions of Contract (SCC) shall be read in conjunction with General Conditions of Contract (GCC), Section-III. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

**1 Brief description of the work**

BMRCL has proposed for "**Shifting of 300mm, 150mm and 100mm dia DI water supply line of BWSSB Utilities infringing with Metro Alignment at proposed elevated Airport Metro Line at Indian Air Force (IAF) premises of BMRCL Phase - 2B Project**" of Bangalore Metro Rail Project.

**2 General**

The Works are handled by the concerned Engineer-in-charge and will be assisted by authorized Officer for monitoring the proper execution of all the works and for measurement of works executed by the Contractor.

**3 Brief scope of work**

3.1 The work shall include, but not limited to Supply, Installation, Testing and commissioning of BWSSB / BMRCL water supply, sanitary and civil construction works etc….

3.2 Not used.

3.3 The details of equipment to be supplied, transported, erected, assembled, tested & commissioned are indicated in BOQ / Pricing document. The quantities indicated in the BOQ / Pricing document are only approximate and may increase or decrease and prices quoted by the Tenderer are deemed to be valid in spite of such subject to SCC Clause 10.

3.4 Any other items not specifically mentioned but which are essentially required for satisfactory performance & completeness of work, shall be deemed to be included in the scope of specifications and works and the same shall be executed / carried out by the Tenderer at no extra cost to BMRCL.

**4 Standards:**

4.1 Unless otherwise stated, all equipment / materials to be supplied and used under this Contract shall be new. All equipment / materials to be supplied / provided and work to be performed under the specifications shall in general conform to the latest issues including amendments of the B.I standards mentioned under respective equipment's heads.

4.2 For materials in respect of which no specifications have been indicated, such materials shall conform to the latest Indian Standard or in its absence, any other International Standard.

4.3 All materials used should be BMRCL / BWSSB approved makes and work should be executed as per BMRCL requirement.

**5 General requirements**

5.1 All equipment/materials shall be submitted for inspection by a duly authorized representative of the Engineer-in-charge. Inspection may be made at any stage of manufacture, dispatch or at site or at these places at the option of the Engineer-in charge and the equipment dispatched/about to be dispatched, if found unsatisfactory as to workmanship or quality, the same is liable to be rejected.

The successful Tenderer / Contractor shall grant free access to the places of manufacture to the authorized representative of the Engineer-in-charge at all times when the works related to the manufacture are in progress.

5.2 Inspection and acceptance of any equipment / materials under the specifications by the Engineer-in-charge or his authorized representative shall not relieve the Contractor of his obligations of furnishing / supplying the equipment in accordance with the specifications.

5.3 All equipment / materials being supplied by the Contractor shall conform to the Type tests and shall be subject to Routine tests in accordance with relevant standards.

5.4 Type tests and routine tests on the equipment / materials being supplied, whenever specified shall be carried out in accordance with relevant standards, at the Contractor's cost. Copies of all routine test certificates of the following equipment shall be furnished to the Engineer.

5.5 Routine tests shall be witnessed at the manufacturer's premises in respect of the above materials by the representative of BMRCL.

5.6 The Contractor shall issue at least 7 days clear notice of routine tests to be conducted with details of time, place and venue to facilitate the representative of the Engineer to witness and certify such tests. In case any of the material is rejected during such test, the Contractor shall pay a penalty of Rs. 20,000.00/- (Rupees Twenty Thousand only) for each such failure when attended by the Engineer-in-Charge's representative.

5.7 For all other materials, not specifically mentioned above, the test certificate with regard to Type test and Routine Tests shall be furnished before the same are used for the works. The inspection and certification by the representative of the Engineer at the manufacturer's premises is not mandatory for such materials.

5.8 BMRCL reserves the right of getting any field test conducted on completely assembled equipment at site.

5.9 The Contractor is fully responsible for the Equipment / Material until the same is handed over to BMRCL in an operating condition after Commissioning. The Contractor is responsible for the proper maintenance of equipment / material as well as protection of the same against theft, elements of nature, damages etc., while in his custody as well as after erection until the same is taken over by BMRCL concern department under due acknowledgment in writing.

5.10 The entire works to be executed under this Contract will be in stages & requires obtaining Line Clear Permits from the Engineer-in-charges representative or his subordinate before taking up the works by the Contractor from BMRCL / BWSSB. As such the Contractor shall take all mandatory safety precautions for executing the works & shall obtain Line Clear Permits with the Operational Authorities of the area prior to commencement of works on daily basis.

5.11 The work shall be carried out as per the direction of BMRCL Engineer in-charge. After the completion of BWSSB work, the contractor shall check the functionality of BMRCL/BWSSB Water supply / sanitary pipe line Installations during warranty period once in a fortnight and submit the report to Engineer in-charge/office of the Chief Engineer (U/S) BMRCL. The Tenderer should have an office / service center in Bangalore.

**6 Acceptance of supplies**

6.1 All or any articles / equipments / materials supplied against this Contract will be subject to the inspection and approval of BMRCL and/or any other officer deputed for the purpose.

**7 Claims, Disputes, Conciliation and Arbitration**

7.1 **Procedure for Claims**

If the Contractor intends to claim any additional payment under any clause of these Conditions or otherwise, the Contractor shall give notice to the Engineer as soon as possible and in any event within 30 days of the start of the event giving rise to the claim.

The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at any other location acceptable to the Engineer. Without admitting the Employer's liability, the Engineer shall, on receipt of such notice, inspect such records and may instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer to inspect all such records, and shall (if instructed) submit copies to the Engineer.

Within 30 days of such notice, or such other time as may be agreed by the Engineer, the Contractor shall send to the Engineer an account, giving detailed particulars of the amount and basis of the claim. Where the event giving rise to the claim has a continuing effect, such amount shall be considered as interim. The Contractor shall then, at such intervals as the Engineer may reasonably require, send further interim accounts giving the accumulated amount of the claim and any further particulars. Where interim accounts are sent to the Engineer, the Contractor shall send a final account within 30 days of the end of the effects resulting from the event.

If the Contractor fails to comply with this Sub-Clause, he shall not be entitled to claim any additional payment.

7.2 **Amicable Settlement**

The Employer and the Contractor shall make every effort to resolve amicably through negotiation, any disagreement or dispute arising between them under or in connection with the Contract.

7.3 **No legal action till Dispute settlement procedure is Exhausted**

Any and all Disputes shall be settled in accordance with the provisions of Clause 7. No action at law concerning or arising out of any Dispute shall be commenced unless and until all applicable Dispute resolution procedures set out in Clause 7 shall have been finally exhausted in relation to that Dispute or any Dispute out of which that Dispute shall have arisen with which it may be / may have been connected.

7.4 **Notice of Disputes**

For the purpose of Sub-Clause 7.5, a Dispute shall be deemed to arise when one party serves on the other party a notice in writing (hereinafter called a "Notice of Dispute") stating the nature of the Dispute provided that no such notice shall be served later than 28 days after the date of issue of Performance Certificate by the Engineer.

7.5 **Two Stages for Dispute Resolution**

Disputes shall be settled through two stages

a) Conciliation procedures as established by "The Arbitration and Conciliation Act-1996" (as amended from time to time) and in accordance with this Clause. In the event this procedure fails to resolve the Dispute then;

b) Arbitration procedures undertaken as provided by "The Arbitration and Conciliation Act -1996" (as amended from time to time) and in accordance with this Clause.

7.6 **Conciliation**

Within 60 days of receipt of Notice of Dispute, either party shall refer the matter in dispute to conciliation.

Conciliation proceedings shall be initiated within 30 days of one party inviting the other in writing to Conciliation. Conciliation shall commence when the other party accepts in writing this invitation. If the invitation is not accepted, then Conciliation shall not take place. If the party initiating conciliation does not receive a reply within 30 days from the date on which he sends the invitation, he may elect to treat this as a rejection of the invitation to conciliate and inform the other party accordingly.

The Conciliation shall be undertaken by one Conciliator selected from a panel of Conciliators maintained by the Employer. The Conciliator shall assist the parties to reach an amicable settlement in an independent and impartial manner.

7.7 **Conciliation Procedure**

The Employer shall maintain a panel of Conciliators with requisite qualifications and professional experience who shall be from serving or retired Engineers of Government Departments, or of Public Sector Undertakings. Out of this panel, a list of three Conciliators shall be sent to the Contractor who shall choose one of them to act as Conciliator and conduct conciliation proceedings in accordance with "The Arbitration and Conciliation Act, 1996", of India. The party serving notice of dispute on the other party shall also serve such notice on the Conciliator chosen as per this Clause.
The Employer at the time of offering the panel of Conciliators to be appointed as Conciliator shall also supply the information with regard to the qualifications of the said Conciliators nominated in the panel along with their professional experience, phone nos. and addresses to the Contractor.
In the event of the Contractor not choosing the Conciliator from the panel furnished by the Employer, within a period of 30 days, the Employer is at liberty to choose and nominate a Conciliator from the same panel and communicate to the Contractor which will be final and binding on the Contractor.
The Employer and the Contractor shall in good faith co-operate with the Conciliator and, in particular, shall endeavor to comply with requests by the Conciliator to submit written materials, provide evidence and attend meetings. Each party may, on his own initiative or at the invitation of the Conciliator, submit to the Conciliator suggestions for the settlement of the dispute.
When it appears to the Conciliator that there exist elements of a settlement which may be acceptable to the parties, he shall formulate the terms of a possible settlement and submit them to the parties for their observations. After receiving the observations of the parties, the Conciliator may reformulate the terms of a possible settlement in the light of such observations.

If the Parties reach agreement on a settlement of the dispute, they may draw up and sign a written settlement agreement. If requested by the parties, the Conciliator may draw up, or assist the parties in drawing up, the settlement agreement.

When the parties sign the settlement agreement, it shall be final and binding on the parties and persons claiming under them respectively.

The Conciliator shall authenticate the settlement agreement and furnish a copy thereof to each of the parties.

As far as possible, the conciliation proceedings should be completed within 60 days of the receipt of notice by the Conciliator.

The parties shall not initiate, during the conciliation proceedings, any arbitral or judicial proceedings in respect of a dispute that is the subject matter of the conciliation proceedings.

7.8 **Termination of Conciliation Proceedings**

The conciliation proceedings shall be terminated:

a) by the signing of the settlement agreement by the parties on the date of agreement;

or

b) by written declaration of the conciliator, after consultation with the parties, to the effect further efforts at conciliation are no longer justified, on the date of declaration;

or

c) by a written declaration of the parties to the conciliator to the effect that the conciliation proceedings are terminated, on the date of declaration;

or

d) by a written declaration of a party to the other party and the conciliator, if appointed, to the effect that the conciliation proceedings are terminated, on the date of declaration.

Upon termination of the conciliation proceedings, the Conciliator shall fix the costs of the conciliation and give written notice thereof to the Parties. The costs shall be borne equally by the parties unless settlement agreement provides for a different apportionment. All other expenses incurred by a party shall be borne by that party.

7.9 **Arbitration**

If the efforts to resolve all or any of the disputes through conciliation fails, then such disputes or differences, whatsoever arising between the parties, arising out of or touching or relating to construction/ manufacture, measuring operation or

a) Only such dispute(s) or difference(s) in respect of which notice has been made under Clause 7.1 but could not be settled through Conciliation, together with counter claims or set off, given by the Employer, shall be referred to arbitration. Other matter shall not be included in the reference.
b) The Arbitration proceedings shall be assumed to have commenced from the day, a written and valid demand for arbitration is received by Employer.
c) The dispute so referred to arbitration shall be settled in accordance with the Arbitration & Conciliation Act, 1996 as amended by the Arbitration & Conciliation (Amendment) Act, 2015 and any statutory modification or re-enactment thereof.

7.9.1 Further, it is agreed between the parties as under:

Number of Arbitrators: The arbitral tribunal shall consist of

i) Sole Arbitrator in cases where total value of all claims in question added together does not exceed Rs. 2.00 crores;

ii) Three (3) arbitrators in all other cases.

7.9.2 **Procedure for Appointment of Arbitrators:**

The arbitrators shall be appointed as per following procedure:

i) In case of Sole Arbitrator: Within 60 days from the day when a written and valid demand for arbitration is received by Employer, the Employer will forward a panel of 03 names to the Contractor. The Contractor shall have to choose one Arbitrator from the panel of three, to be appointed as Sole Arbitrator within 30 days of dispatch of the request by the Employer. In case the Contractor fails to choose one Arbitrator within 30 days of dispatch of the request of the Employer then Employer shall appoint any one Arbitrator from the said panel of 03 Arbitrator, as Sole Arbitrator.

ii) In case of 3 Arbitrators:

a) Within 60 days from the day when a written and valid demand for Arbitration is received by Employer, the Employer will forward a panel of 5 names to the Contractor. The Contractor will then give his consent for any one name out of the said panel, to be appointed as one of the Arbitrators within 30 days of dispatch of the request by the Employer.

b) Employer will decide the second Arbitrator. Employer shall appoint the second Arbitrator, in addition to the Arbitrator for whom consent was given by the Contractor, within the 30 days from the receipt of the communication regarding appointment of first Arbitrator from the Contractor. In case the Contractor fails to give his consent within 30 days of dispatch of the request of the Employer, then Employer shall nominate both the Arbitrators from the said panel.

c) The third Arbitrator shall be chosen by the two Arbitrators so appointed by the parties out of the panel of 05 Arbitrators provided to Contractor or from the larger panel of Arbitrators to be provided to them by Employer at the request of two appointed Arbitrators (if so desired by them) and who shall act as Presiding Arbitrator. In case of failure of two appointed Arbitrators to reach upon consensus within period of thirty days from the date of their appointment, then, upon the request of either or both parties, the Presiding Arbitrator shall be appointed by the Employer, from above Panel.

d) If one or more of the Arbitrators appointed as above refuses to act as Arbitrator, withdraws from his office as Arbitrator, or vacates his/their office/offices or is/are unable or unwilling to perform his functions as Arbitrator for any reason whatsoever or dies or in the opinion of the Employer fails to act without undue delay, the Employer shall appoint new Arbitrator/ Arbitrators to act in his/their place except in case of new Presiding Arbitrator who shall be chosen following the same procedure as mentioned in para (ii)(c)

above. Such reconstituted Tribunal may, at its discretion, proceed with the reference from the stage at which it was left by the previous Arbitrator(s).

e) The Employer at the time of offering the panel of Arbitrator(s) to be appointed as Arbitrator shall also supply the information with regard to the qualification of the said Arbitrators nominated in the panel along with their professional experience, phone nos. and addresses to the Contractor.

7.9.3 **Qualification and Experience of Arbitrators (to be appointed as per sub clause 7.9.2 above):**

The Arbitrators to be appointed shall have minimum qualification and experience as under:

Arbitrator shall be;

A Working / Retired Officer (not below E-8 grade in a PSU with which BMRCL has no business relationship) of any discipline of Engineering or Accounts / Finance department, having experience in Contract Management of Construction Contracts; or A Retired Officer (retired not below the SAG level in Railways) of any Engineering Services of Indian Railways or Indian Railway Account Service, having experience in Contract Management of Construction Contracts; or a Retired Officer who should have retired more than 3 years previously from date of appointment as Arbitrator (retired not below E-8 grade in BMRCL or a PSU with which BMRCL has a business relationship) of any Engineering discipline or Accounts / Finance department, having experience in Contract Management of Construction Contracts or retired judge of any High Court or Supreme Court of India or reputed Chartered Accountant & should be a member of ICAI, New Delhi. No person other than the persons appointed as per above procedure and having above qualification and experience shall act as Arbitrator.

7.9.4 No new claim shall be added during proceedings by either party. However, a party may amend or supplement the original claim or defiance thereof during the course of arbitration proceedings subject to acceptance by tribunal having due regard to the delay in making it.

7.9.5 Neither party shall be limited in the proceedings before such arbitrator(s) to the evidence adduced or arguments put forth before the Engineer for the purpose of obtaining his decision. No decision given by the Engineer in accordance with the foregoing provisions shall disqualify him from being called as a witness and giving evidence before the arbitrator(s) on any matter, whatsoever relevant to dispute or difference referred to arbitrator/s. Neither party shall be limited in proceedings before such arbitrators to the evidence produced earlier or the arguments previously put forth during settlement through Conciliation proceedings.

7.9.6 It is agreed by both the Parties that in cases where Arbitral Tribunal consists of a Sole Arbitrator their disputes shall be resolved by the fast track procedure specified in sub-section (3) of 29B of the Arbitration and Conciliation (Amendment) Act, 2015 or as amended up to date.

7.9.7 If the contractor/s does/do not prefer his/their specific and final claims in writing, within a period of 90 days of receiving the intimation from the Employer/Engineer that the final bill is ready for signature of the Contractor(s), he/they will be deemed to have waived his/their claim(s) and the Employer shall be discharged and released of all liabilities under the contract in respect of these claims.

7.9.8 Arbitration proceedings shall be held at Bengaluru, India and the language of the arbitration proceedings and that of all documents and communications between the parties shall be in English.

7.9.9 The Arbitral Tribunal should record day to day proceeding. The proceedings shall normally be conducted on the basis of documents and written statements. All arbitration awards shall be in writing and shall state item wise, the sums awarded or claims rejected and detailed reasons upon which it is based. A model time schedule for conduct of Arbitration proceedings in a period of 180 days/ 365 days will be made available to Arbitral Tribunal for their guidance. Both the parties should endeavor to adhere to time schedule for early finalization of award.

7.9.10 The award of the sole Arbitrator or the award by majority of three Arbitrators as the case may be shall be binding on all parties. Any ruling on award shall be made by a majority of members of Tribunal. In the absence of such a majority, the views of Presiding Arbitrator shall prevail.

7.9.11 A party may apply for correction of any computational errors, any typographical or clerical errors or any other mathematical error of similar nature occurring in the award of a tribunal and interpretation of specific point of award to tribunal within 60 days of the receipt of award.

7.9.12 A party may apply to tribunal within 60 days of receipt of award to make an additional award as to claims presented in the arbitral proceedings but omitted from the arbitral award.

7.10 **Reasoned Award**

The Arbitrator(s) shall always give item-wise and reasoned award(s) irrespective of the value of claim(s) in the dispute in all cases.

7.11 **Interest on Arbitration Award**

Where the arbitral award is for the payment of money, no interest shall be payable on whole or any part of the money for any period, till the date on which the award is made.

7.12 **Cost of Arbitration**

The cost of arbitration shall be borne by the respective Parties. The cost shall, inter-alia, include the fees of the Arbitrator(s) as per rates fixed by the Employer from time to time.

7.13 **Suspension of Work on Account of Arbitration**

The reference to Conciliation / Arbitration shall proceed not withstanding that the Works shall not then be or be alleged to be complete, provided always that the obligations of the Employer, Engineer and the Contractor shall not be altered by reasons of arbitration being conducted during the progress of the Works. Neither party shall be entitled to suspend the work or part of the work to which the dispute relates on account of arbitration and payments to the Contractor shall continue to be made in terms of the Contract.

**8 Indemnity bond:**

8.1 It will be the responsibility of the Contractor to make/take delivery, unload and store all the material / Equipment. The Contractor shall execute an Indemnity Bond as per the proforma enclosed in Annexure D of Section VI in favour of BMRCL against loss, damage and any risks involved for the full value of these materials. This Indemnity Bond shall be furnished by the Contractor before commencement of the supplies and shall be valid till the scheduled date of Testing & Commissioning and handing over of the work to the Engineer.

8.2 For the Equipment's / Materials to be provided by the owner, the Contractor shall adopt the following procedure to take delivery of Equipment's/materials.

a) The dispatch title documents will be handed over to the Contractor only after obtaining a Test Report in respect of plant, equipment and materials as per prescribed proforma.
b) The Indemnity Bond as per proforma, enclosed as Annexure-D in Section VI shall be executed by the Contractor.
c) BMRCL will also issue a separate authorization letter to the Contractor to enable him to take physical delivery of Materials/Plant/Equipment's (if required).

**9 Storage cum erection insurance:**

9.1 All the Equipment and Materials being supplied by the Contractor for the Package shall be kept completely insured by the Contractor at his cost from the time of dispatch from their works, up to the completion of erection, Testing and Commissioning at site and taking over of the project by the Owner in accordance with the Contract.

9.2 Further all the Equipment and Materials being supplied by the Owner for the erection as per Technical Specification shall be kept insured by the Contractor against any loss. damage, pilferage, theft, fire etc. from the time of unloading up to the time of taking over by the Owner including handling, transportation, storage, Erection, Testing Commissioning etc. The premium to be paid to the Insurance Company by the Contractor for such Insurance shall be included in the total Tender price.

9.3 It will be the responsibility of the Contractor to lodge, pursue and settle claims with the Insurance Company in case of any loss. Pilferage, theft, or fire and the Owner shall be kept informed about it. The Contractor shall be responsible to replace any such equipment / material during execution of the Contract irrespective of the time or amount of receipt of insurance claim. Any loss in this regard shall be borne by the Contractor

**10 Quantity variation**

10.1 The quantities indicated in Schedule of prices are only approximate & may increase or decrease during the execution of the Contract. BMRCL reserves the right to increase or decrease the quantities of items under the Contract but without any change in unit prices or other terms & conditions. Such increase or decrease may vary up to **100%** of the Contracted quantity of individual items subject to a maximum of **+ /- 25% (Twenty Five Percent)** of the original Contract value. However, the prices quoted by the Tenderer and other terms and conditions shall be valid in spite of such variations in quantities.

10.2 For any additional item/s not found in the BOQ, if it is required to be executed for completion of the work under this Contract, the rate shall be as per BESCOM/KPWD Schedule of Rates plus or minus or at par Tender premium which BMRCL has accepted. If the item required is not found in any of the Schedule of Rates, then the mutually agreed market rate shall be adopted but no Tender premium would be applicable.

**11 Priority of documents**

The documents forming the Contract are to be taken as mutually explanatory of one another. If there is an ambiguity or discrepancy in the documents, the Engineer shall issue any necessary clarification or instruction to the Contractor, and the priority of the documents shall be as follows:

(1) Contract Agreement
(2) Letter of Acceptance, notice to proceed with works
(3) Priced Bill of quantities (as accepted by the Employer)
(4) Technical Specifications
(5) Drawings
(6) Special Conditions of Contract
(7) General Conditions of Contract
(8) Contractor's Proposal and
(9) Any other document listed as forming part of the Contract.

**12 Payment in stages**

Compensation for items shall include for all costs incurred in procurement/ manufacture, testing, inspection, shipping, hauling, off-loading, storing at site in Bangalore, installation, testing and commissioning including integrated testing and commissioning. Prices so assigned in the BOQ, for supply and installation of items of materials, plant and equipment shall be full compensation for supply and installation of items of materials, plant and equipment in accordance with drawings and specifications, Payment towards supply and installation will be made after receipt of items of materials, plant and equipment to the Contractor's depot (in the land provided by BMRCL) in Bangalore and storing them in a place and manner approved by the Engineer and submission of the following documents:

(i) Certificate of type tests
(ii) Certificate of Factory Acceptance Testes;
(iii) Certificate of inspection by the Engineer
(iv) Proof of Insurance
(v) Technical literature and equipment manual;
(vi) Packing list; and
(vii) Joint record of measurement in approved format, on the following basis;

a) 70% payment on supply of materials, 20% of payment for installation and balance 10% of payment on completion of integrated testing, commissioning, submission of all test reports, other documentation including as-built drawings, guarantee warranty certificates, manuals etc. for
   (i) Pipes and
   (ii) Valves
b) 60% payment against supply of material, 30% payment against installation and balance 10% price so assigned for testing and commissioning of items of materials, plant and equipment is tested and commissioned successfully including integrated testing and commissioning and submission of all test results, other documentation including as-built drawings, manuals, etc., as described in the specifications, have been approved by the Engineer.

c) Payment will be made in RA bills as part payments duly certified by BMRCL for receipt of materials in good condition and correct quantity.

d) Original invoice voucher to be verified by BMRCL and copy to be enclosed with RA bills.

e) Security & Safety of material brought to the site will be sole responsibility of contractor till the completion of corresponding work and handing over to BMRCL.

**13 Contractor to Co-ordinate his Work with Other Contractors**

The Contractor has to co-ordinate with the other concerned Contractors as already specified in Conditions of Contract for all such works as per the directions of Engineer in charge at no extra cost.

**14 Continuation of Work:**

In case of the death of a contractor after executing the agreement / commencement of the work, his legal heir, if any eligible registered contractor and willing, can execute and complete the work at the accepted tender rates irrespective of the cost of the work

**Following conditions will also become part of the agreement.**

a) All applicable taxes payable in respect of work shall be paid by the contractor to the concerned departments.

b) The Contractor shall use tertiary treated water from BWSSB wherever available for Construction, Hydro testing at the prevailing rates of BWSSB.

c) The supply of pipes and other materials shall be initially for only 50% of the quantity of BOQ is considered and further supply will be as per the recommendations of the Engineer-in-Charge based on the requirement.

d) All required permissions / RWO issues from all concerned departments shall be obtained from the contractor and Board Engineers will assist for the same.

e) No variation work will be executed by the firm unless approval is conveyed from the competent authority.

f) One designated qualified safety officer / Engineer shall be deployed at site by the contractor.

g) The contractor shall comply with all the legal requirements in the matter of employment of workmen and provide all safety gadgets to the workmen while working in the hazards place or conditions during the execution of the contract.

h) Road cutting should be executed through road cutting machine only.

i) Contractor shall be fully responsible in the event of death of employee / workman during the execution of the work and liable to pay adequate compensation to the dependents of employee / workman as per law.

j) In case of any failure by the contractor in fulfillment of contractual / statutory obligations, employer shall be indemnified from all liabilities arising out of such failures / non fulfillments of such obligations.

k) If death of any employees occurs during execution of work due to negligence of contractor, the contract will be liable for termination and for further consequences the contractor is wholly responsible for the same.

l) In the event of such termination, the employer may consider blacklisting of the contractor after due notice.

m) In case of any death or accident the contract will be cancelled after following due process:

1) BMRCL will be entitled to claim exemplary damages from the contractor in case of death of any work man / employees of the contractor in any of the BWSSB works as it damages the reputation of the Employer.

2) Any utilities encountered during execution if damaged by the contractor, the same need to be rectified immediately without any delay at his own cost with due approval from the concerned Engineer.

**********

# SECTION – V

# FORM OF TENDER

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# FORM OF TENDER

(Refer ITT clause 36.6)

Ref No.: Date. dd.mm.yyyy

From:

To:

The Managing Director
BANGALORE METRO RAIL CORPORATION LIMITED,
III Floor, BMTC Complex, K.H. Road,
Shanthinagar,
Bangalore-560 027.

Sir,

1. Having examined and understood the Instructions to Tenderer, General Conditions of the Contract, Special Conditions of Contract, Technical Specifications and any other documents forming part of the Tender document issued under Tender notification no. …….. dated …….. including any addendum /amendments, the receipt of which is hereby duly acknowledged, I/We the undersigned, hereby submit the fully completed Tender proposal, which includes the following.

    a) Qualification cum Technical Package

    b) Financial Package

    for the said work online through Karnataka Public Procurement Portal (e-Procurement portal).

2. I/We hereby agree to execute the Contract in conformity with the Specifications & Conditions of Contract enumerated in the Tender Documents, for the sum stated & quoted in the Tender or such other sums as may be ascertained in accordance with the Financial Proposal attached herewith and submitted through e-Procurement portal.
3. We undertake that, in competing for (and, if the award is made to us, in executing) the above Contract, we will strictly observe the laws against fraud and corruption in force in India namely “Prevention of Corruption Act 1988”.
4. We hereby confirm that this Tender complies with the Tender validity and Tender Security / EMD required by the Tender documents.
5. I/We undertake, if the Tender is accepted, to execute the Contract Agreement with in the stipulated time of 21 (twenty-one) working days.
6. In case of acceptance of the Tender, I/We also undertake to carry out supply, installation, testing and commissioning of the Works and complete the same and commission within the stipulated time as specified in the Tender documents and further will obtain and furnish Performance Security for the amount/s specified in ‘Appendix to Form of Tender’ (Section-V) for the due performance of Contract.
7. I/We note that the prices offered are firm throughout the period of Contract including extended period if any as per the Commercial Terms and Conditions.
8. I/We agree to keep this Tender valid for a period specified in ‘Appendix to Form of Tender’ (Section-V) & it shall remain binding upon us & may be accepted at any time before expiration of that period.

9. Since time is the essence of Contract, I/We undertake that all care is taken not to overrun the time specified and agree to pay penalty (one percent of the Original Contract Price / week subject to a maximum of ten percent) of the value of work which is not completed for the delay beyond the period specified for completion of the work.
10. I/We have enclosed **BG for Rs**._____vide **BG No**._____, **Dated.**_____**of**_____Bank drawn in favour of the Managing Director, BMRCL, Bangalore-560 027 payable at a designated Bank in Bangalore being the requisite EMD as per Karnataka e-Procurement Portal.
11. Until a Contract is prepared & executed this Tender together with written acceptance by BMRCL by notification of Award shall constitute a binding Contract.
12. I/We understand that BMRCL is not bound to accept the lowest or any Tender it may receive.

Dated this …….. day of ……, 2023.

(Signature)

Name in Block Letter

(In the capacity of)

(DESIGNATION)

**Duly authorized to sign Tender for and on behalf of (NAME OF FIRM)**

**Witness:**

**Address:** **Signature**

## APPENDIX TO FORM OF TENDER

## SALIENT FEATURES OF CONTRACT

| No. | Reference Contract Clauses | Description |
|---|---|---|
| 1. | Amount of Performance Security<br>(GCC - Clause 12) | **10% (Ten percent) of the Contract Price** in which the Contract price is payable. In the event of variations during the execution of the Contract which result in payments to the Contractor over and above the original Contract price, the Performance Security shall be suitably adjusted. |
| 2. | Date for commencement of the Works (ITT - Clause 31) | Date of issue of Letter of Award (LOA). |
| 3. | Time for Completion<br>(GCC clause 27) | The works shall be completed in all respects within **9 months** from the date of commencement including monsoon period. |
| 4. | Penalty for delay in execution of work<br>(GCC-Clause 29) | i. The penalty shall be 1 % of the original Contract price per week of delay or part thereof subject to a maximum of 10% on the portion of work which is not completed for beneficial use<br>ii. Penalties levied for the following:<br>a) Non-fulfillment of program of works within the stipulated period.<br>b) The number of days allowed beyond the stipulated period for completing the work and<br>c) Extra cost that might be incurred by BMRCL for getting the balance work completed through any other agency as it deems fit under the circumstances will be deducted from money due to him by BMRCL for work done under the Contract or otherwise. |
| 5. | Guarantee of Works / Defects Liability Period<br>(GCC-Clause 35) | For a period of **12 months** from the date of issue of the Completion Certificate / Taking Over Certificate, the Contractor shall be liable for the works or any portion thereof found to be defective for causes arising from faulty materials or workmanship or other causes for which in the judgment of BMRCL/BWSSB, the Contractor is responsible. |
| 6. | Period in which all insurances have to be effected<br>(GCC Sub-Clause 37 and SCC Clause 9) | The Contractor shall maintain adequate Insurance Coverage at all time during the period of Contract and the premium to be paid to the Insurance Company by the Contractor for such Insurance shall be included in the total Tender price. |
| 7. | Validity of Tender<br>(ITT Clause 17) | **120 days** from the last date for Tender submission. |
| 8. | Amount and validity of Tender Security / EMD<br>(ITT Clause 16) | • **INR 1,87,639/-** (Rupees One Lakh Eighty Seven Thousand Six Hundered and Thirty Nine Only).<br>• 45 days beyond the validity date of the Tender i.e. **165 days from the last date for Tender submission as per e-Procurement Portal.** |

| No. | Reference Contract Clauses | Description |
|---|---|---|
| 9. | Date & time and place of Tender Submission and Tender opening<br><br>(ITT clause 13 and ITT clause 20) | • **Date and Time**<br>As per Date and Time specified in Karnataka Public Procurement Portal**.**<br><br>• **Place of submission of Original documents** as listed under ITT clause 13.2:<br>The Chief Engineer(U/S)<br>BMRCL, BMTC Complex,<br>III Floor, Shanthinagar,<br>Bangalore 560027.<br><br>• **Tender proposal to be submitted online in Karnataka Public Procurement Portal.** |
| 10. | Contractor's Name and Address | ---------- *(Tenderers to complete)* ---------- |
| 11. | Employer's Name and Address | Bangalore Metro Rail Corporation Limited<br>III Floor, BMTC Complex, K.H.Road,<br>Shanthinagar, Bangalore-560 027,<br>Karnataka State, India |
| 12. | Last date up to which clarification on Tender conditions can be sought | As per Date and Time specified in Karnataka Public Procurement Portal**.** |

# SECTION - VI

# PROFORMA


| | | |
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**Annexure – A**

## FORM OF AGREEMENT

(as per 33.0 of ITT)

## CONTRACT No. BMRCL…….....

This **Contract Agreement** (hereinafter called the **"Contract"**) is made at Bangalore on the .....day of ".....*Month & Year*....." by and between:

**BANGALORE METRO RAIL CORPORATION LIMITED,** a Company incorporated under Companies Act 1956, represented herein by ……., authorized to sign and bind the Company, with its office located at III Floor, BMTC Complex, K.H. Road, Shanthinagar, Bengaluru 560 027, Karnataka State, India hereinafter referred to as the **"BMRCL"** or the **"EMPLOYER"**, as the case may be, which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include its successors and assigns, of the one part,

and

M/s. ".....(*Name of Contractor*) ....." a proprietorship concern having their office/principal place of business at "……*Address*……." represented by its ……. herein referred to as the **"CONTRACTOR"** which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include its successors to business, legal heir and assigns, on the other part,

WHEREAS the Contractor has offered a Tender for the work of "……. *(name of works)* ....." and for this purpose agrees to undertake performance of the work under the Terms and Conditions set forth in this Contract.

AND WHEREAS BMRCL has accepted the Tender submitted by the Contractor for execution of the aforesaid Work and agrees to hire the 'Contractor' and the 'Contractor' agrees to be hired to implement the work of "…… *(name of works)* ....." vide CONTRACT No. BMRCL……. under the Terms and conditions specified in this Contract Agreement and the other Contract Documents.

Now THEREFORE the parties hereby agree as follows:

**Clause 1: Words and Expression**

In this Contract, all the words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

**Clause 2: The Contract Documents**

The following shall be deemed to form and be read and construed as a part of this Contract Agreement:

a) Letter of Award No. …… dated .....
b) Instructions to Tenderers / Bidders
c) General Conditions of Contract.
d) Special Conditions of Contract
e) Bid Forms / Tender Forms
f) Technical Specifications including scope of Work.
g) Priced Bill of quantities.

h) Contractor's Technical and Financial proposal date.....
i) Drawings.
j) All correspondence between the Tenderer / Bidder and BMRCL from the date of issue of NIT and the date of issue of LOA.
k) Performance Security in the form of Bank Guarantee issued by Bank……..(Write name of the Bank) vide B.G. No…….. dated…… amounting to Rs…… (in words) ……. valid up to …… and its authenticity as confirmed by the issuing bank vide their SFMS No……. dated……...
l) Any other document forming part of this Contract.

All of the foregoing documents, together with this Contract Agreement, are referred to herein as the Contract. Also incorporated into the Contract and made part hereof, are all codes, standard specifications, and similar requirements that are referred to therein.

**Clause 3: Obligations of the Contractor**

The Contractor agrees, subject to the terms and conditions of the Contract, to perform efficiently and faithfully all of the works of "……*Name of the work*……." which includes "……*brief description of work*…...." required for or incidental to the successful completion of the Works and in carrying out all duties and obligations imposed by, the Contract.

**Clause 4: Obligation of the Employer**

In consideration thereof, the 'Employer' agrees, subject to the terms and conditions of the Contract, to pay the Contractor the amount specified and at the rates and terms and in the manner set forth in the Contract.

**Clause 5: Contract Price and Completion Time:** The Contract price shall be inclusive of all taxes, duties and cess including taxes deducted at source, insurance and exclusive of CGST and SGST. BMRCL shall pay the CGST and SGST as applicable as per law as per clause ..26..... of General Conditions of Contract and completion time for executing the works under the Contract are as specified below:

| | | |
|---|---|---|
| 1. | Amount Specified in the Tender | |
| 2. | Accepted percentage premium of the Tender (Above / Below / At par) | |
| 3. | Accepted Contract Price | |
| 4. | Date of Commencement of work | |
| 5. | Completion period | |

**Clause 6: Integration**

The 'Employer' and the 'Contractor' agree that this Contract Agreement, together with other Contract Documents referred to in clause 2 above, expresses all of the agreements, understandings, promises and covenants of the parties, and integrates, combines and supersedes all prior and contemporaneous negotiations, understandings and agreements, whether written or oral and no modification or alteration of the Contract Documents shall be valid or binding on either party, unless expressed in writing and executed with the same formality as this Contract Agreement, except as may otherwise be specifically provided in the Contract Documents. This contract agreement shall prevail in case of any inconsistencies contained in the contract documents.

**Clause 7: Governing Law**

This Contract is construed and enforceable under the applicable laws of the Republic of India.

**Clause 8: Jurisdiction**

Where recourse to a Court of law is to be made in respect of any matter, the Court at Bangalore shall have the exclusive jurisdiction to try all disputes between Parties, under this contract agreement.

**Clause 9: Language**

This Contract Agreement and the other Contract Documents are made in the English language.

**Clause 10: Notices**

All Notices called by the Terms of the Contract shall be in writing in English Language and shall be delivered by hand or by registered Post with acknowledgement due. All notices shall be deemed to be duly made by the party to whom it is addressed at the following address or such other addresses as such party may subsequently notify the other.

To Employer:

Chief Engineer (U/S)

".....Address ....."

To Contractor:

M/s. ……
……
……..,

IN WITNESS WHEREOF, the parties hereto have caused this Contract to be signed in their respective name by the authorized signatories as of the day and year first above written

| | |
|---|---|
| **BMRCL/The Employer**<br>**Bangalore Metro Rail**<br>**Corporation Limited**<br>**(EMPLOYER)** | **……..,**<br>**(CONTRACTOR)** |
| (……) | (  )<br>M/s ……..,  |
| **WITNESS** | **WITNESS** |
| (……..) | (  )<br>M/s …….. |

***Note:-***

*The Form of Agreement is tentative and may be modified as considered necessary at the time of finalization/signing of the contract.*

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**Annexure – B**

## BANK GUARANTEE FOR TENDER SECURITY/EARNEST MONEY DEPOSIT OF TENDER

(Refer ITT clause 16)

To
Bangalore Metro Rail Corporation Limited (BMRCL)
3rd, floor BMTC Complex,
K.H. Road, Shanthinagar
Bangalore- 560027.
Karnataka, India.

1. **WHEREAS**_____ (Name and Address of the Tenderer hereinafter called the "Tenderer") has undertaken for submission of Tender in pursuance of Contract No._____ (description of the Contract work of Bangalore Metro Rail Project to be specified, hereinafter called "the Tender").

2. AND WHEREAS it has been stipulated in the concerned Tender notification issued by Bangalore metro Rail Corporation Limited (BMRCL) which expression shall unless repugnant to the context or the meaning thereof, include its successors, administrators, executors and assignees, herein after called the Employer) to the Tenderer that the Tenderer shall furnish to EMPLOYER(BMRCL) with a Bank Guarantee as per the conditions of the Tender, from an Indian scheduled Bank (excluding Cooperative Bank) or from a schedule Foreign Bank as defined in Section 2(e) of RBI Act 1934 r/w second schedule for, the sum specified herein below as Tender security for compliance of the obligation and performance, in accordance with the concerned Tender conditions.

3. AND WHEREAS we_____ (the name and full address of the Bank including Email address) having registered office at_____ (hereinafter referred to as the issuing Bank) which expression shall unless repugnant to the context or the meaning thereof, include its successors, administrators, executors and assignees, do hereby agree to give the Contractor such a Bank Guarantee, drawn and payable at Bangalore_____ through Bangalore _____Branch.

4. NOW therefore, we hereby affirm that we are the guarantor and responsible to EMPLOYER(BMRCL) and their successor, on behalf of the Tenderer up to a total sum of Indian Rupees of Rs. _____ (amount of Guarantee to be specified in figure and words), and we hereby further unconditionally, irrevocably and without demur undertake to immediately pay you, upon your first written demand and without cavil, or arguments any sum or sums within the limits of Indian Rupee_____(Bank guarantee amount to be specified) as aforesaid without requiring you to prove or to show grounds or reasons for your demand, by depositing/crediting to the Current A/c. of EMPLOYER (BMRCL), the sums specified therein.

5. This Bank Guarantee is encashable or extendable at our designated Branch in Bengaluru (Bangalore) Karnataka, India, as mentioned below:
   Name of the Bank, Branch and contact details
   Address
   Telephone no: & Fax No:
   E-mail Address
   Branch manager name& mobile No:
   Bank Zonal Office Address, Telephone No:……. Fax Number: ……..
   E-mail Address

6. "This Bank Guarantee shall be encashed unless renewed by the Contractor at the request of the Employer, before the due date".

7. The Bank is liable to pay the EMPLOYER (BMRCL), any amount up to and inclusive of the aforementioned full amount upon written order from the EMPLOYER (BMRCL). The Bank will pay the money required by the EMPLOYER (BMRCL) immediately on demand without delay without reference to the Tenderer and without the necessity of a previous notice or of judicial or administrative procedures and without it being necessary to prove to the Bank the liability or damages resulting from any defects or shortcomings or debts of the Tenderer.

8. BMRCL shall have full rights to encash this Bank Guarantee at any time during the guarantee period and the Tenderer shall have no right or claim whatsoever in the matter of encashment of the Bank Guarantee amount by the Employer (BMRCL). The Bank will have their responsibility in terms of the guarantee and obligation, to make immediate payment to the EMPLOYER (BMRCL), without the consent of the Tenderer and without referring the matter to the Tenderer.

9. Courts at Bangalore, Karnataka, India shall have exclusive jurisdiction to adjudicate disputes arising out of encashment of the Guarantee, and we, the said Bank, undertake not to revoke this Guarantee during its currency, except with the previous consent of the Employer in writing and agree that any change in the constitution of the Bank shall not discharge our liability hereunder.

10. This Bank Guarantee will not be discharged due to the change in the constitution of the Tenderer or change in the constitution of the issuing bank

11. This guarantee is executed and issued by Shri _____who is/are authorized by the Bank for issuing the guarantee in its behalf and his ID No. and Email address being----------

12. The Banks liability under this Guarantee shall not exceed the amount of INR_____ (to be specified in words and figures_____).

13. This guarantee shall be valid for (period to be specified) till ____ (Period to be mentioned).

14. The pendency of any dispute or arbitration or other proceedings shall not affect this guarantee in any manner.

15. It is hereby agreed that the liability of the Bank under this guarantee shall cease on the first occurrence of either of the following events:
    a) Payment by the Bank of the Guaranteed sum in full to the Employer/BMRCL
    OR
    b) Receipt of written communication from the Employer/BMRCL, to the issuing Bank, along with the Original Bank Guarantees discharging the Bank of its liability covered by this Bank Guarantee.

| | |
|---|---|
| SIGNATURE AND SEAL OF THE GUARANTOR | SIGNATURE AND SEAL OF THE GUARANTOR |
| NAME OF THE BANK_____ | NAME OF THE BANK_____ |
| ADDRESS_____ | ADDRESS_____ |
| DATE: | DATE: |

***Notes:***

1. *The stamp papers of appropriate value shall be purchased in the name of the Bank, who issue the Bank Guarantee.*
2. *The Bank Guarantee shall be from an Indian Scheduled bank (excluding Cooperative Banks) or from a schedule Foreign Bank as defined in Section 2(e) of RBI Act 1934 read with Second Schedule, preferably drawn on and payable/extendable at a designated branch at Bangalore only.*
3. *The Scheduled Bank issuing the Bank Guarantee should preferably be on "Structure Financial Messaging System (SFMS)" platform. A separate advice of the BG shall preferably be sent by the issuing bank to the Employer's Bank through SFMS.*
   *The issuing Bank shall send the SFMS to:*
   *Name: BANGALORE METRO RAIL CORPORATION LTD.,*
   *Name of the Bank: BANK OF INDIA*
   *Branch: CANTONMENT BRANCH, BENGALURU.*
   *Account No: 840420110000760*
   *RTGS/IFSC: BKID0008404*

**Annexure - C**

## BANK GUARANTEE FOR PERFORMANCE OF CONTRACT

(Refer ITT clause 3)

To

BANGALORE METRO RAIL CORPORATION LIMITED (BMRCL)
III FLOOR BMTC COMPLEX,
K.H. ROAD, SHANTHINAGAR
BANGALORE- 560027.
KARNATAKA, INDIA.

1. **WHEREAS**_____(Name and Address of the Contractor hereinafter called the "Contractor") has undertaken for due performance of Contract, in pursuance of Contract No._____(description of the Contract work of Bangalore Metro Rail Project to be specified) (hereinafter called "the Contract").

2. **AND WHEREAS** it has been stipulated in the concerned Contract awarded by Bangalore Metro Rail Corporation Limited (BMRCL) hereinafter called the "Employer" which expression shall unless repugnant to the context or the meaning thereof, include its successors, administrators, executors and assignees, to the Contractor that the Contractor shall furnish to EMPLOYER(BMRCL) with a Bank Guarantee for due performance of Contract from an Indian scheduled Bank (excluding Cooperative Bank) or from a schedule Foreign Bank as defined in Section 2(e) of RBI Act 1934 r/w second schedule for, the sum specified herein below as security for compliance of the obligation and performance of the Contractor, in accordance with the concerned Contract.

3. **AND WHEREAS** we_____ (the name and full address of the Bank including Email address) having registered office at_____ (hereinafter referred to as the issuing Bank) which expression shall unless repugnant to the context or the meaning thereof, include its successors, administrators, executors and assignees, do hereby agree to give the EMPLOYER (BMRCL) on behalf of the Contractor such a Bank Guarantee, drawn and payable at Bangalore_____ through our Bangalore _____Branch.

4. **NOW** therefore, we hereby affirm that we are the guarantor and responsible to EMPLOYER (BMRCL) and their successors, on behalf of the Contractor upto a total sum of _____ (amount of Guarantee to be specified in figure and words). Further, we hereby unconditionally, irrevocably and without demur undertake to immediately pay you, upon your first written demand and without cavil, or arguments any sum or sums within the limits of the sum specified in this Bank Guarantee as aforesaid without you being required to prove or to show grounds or reasons for your demand, by depositing/crediting to the Current A/c. of EMPLOYER (BMRCL), the sums specified.

5. This Bank Guarantee is encashable or extendable at our designated Branch in Bengaluru (Bangalore) Karnataka, India, as mentioned below:

   Name of the Bank, Branch and contact details
   Address
   Telephone no: & Fax No:
   E-mail Address
   Branch manager name & mobile No:
   Bank Zonal Office Address, Telephone No: Fax Number,
   E-mail Address

6. "This Bank Guarantee shall be encashed unless renewed by the Contractor at the request of the Employer, before the due date".

7. BMRCL shall have rights to encash this Bank Guarantee at any time during the guarantee period and the Contractor shall have no right or claim whatsoever in the matter of encashment of the Bank Guarantee amount by the Employer. The Bank will have their responsibility in terms of the guarantee

and obligation, to make immediate payment to the EMPLOYER (BMRCL), without the consent of the Contractor and without referring the matter to the Contractor.

8. The Bank shall be liable to pay the EMPLOYER (BMRCL), any amount upto and inclusive of the aforementioned full amount upon written order from the EMPLOYER (BMRCL) to indemnify BMRCL for any liability of damage resulting from any defects and/or shortcomings of the Contractor and/or the debts the Contractor may have incurred, to EMPLOYER(BMRCL) and/or any parties involved in the Works under the Contract mentioned above, whether these defects and/or shortcomings and/or debts are actual and/or estimated and/or expected. The Bank will deliver the money required by the EMPLOYER (BMRCL) immediately on demand without delay without reference to the Contractor and without the necessity of a previous notice or of judicial or administrative procedures and without it being necessary to prove to the Bank the liability or damages resulting from any defects or shortcomings or debts of the Contractor.
9. Courts at Bangalore, Karnataka, India shall have exclusive jurisdiction for adjudicating the disputes arising out of encashment of the Guarantee, and we, the said Bank under take not to revoke this Guarantee during its currency, except with the previous consent of the Employer in writing and agree that any change in the constitution of the Bank shall not discharge our liability hereunder.
10. This Bank Guarantee will not be discharged due to the change in the constitution of the Contractor or change in the constitution of the issuing bank.
11. This Deed of guarantee is signed and executed by Shri _____who is/are authorized by the Bank for issuing the guarantee in its behalf and his ID No. and Email address being _____.
12. The Bank's liability under this Guarantee shall not exceed the amount of INR _____ (to be specified in words and figures_____).
13. This guarantee shall be valid for (period to be specified) till _____ (Period to be mentioned).
14. The pendency of any dispute or arbitration or other proceedings shall not affect this guarantee in any manner.
15. It is hereby agreed that the liability of the Bank under this guarantee shall cease on the happening of any of the following events:
    a) Payment by the Bank of the Guaranteed sum in full to the Employer/ BMRCL

    or

    b) Issue of written communication by the Employer/BMRCL to the issuing Bank, along with the Original Bank Guarantees discharging the Bank of its liability covered by this Bank Guarantee.

Date SIGNATURE AND SEAL OF THE GUARANTOR

NAME OF THE BANK_____

ADDRESS_____

---

*Notes:*

1. *The stamp papers of appropriate value shall be purchased in the name of the Bank, who issue the Bank Guarantee.*
2. *The Bank Guarantee shall be from an Indian Scheduled bank (excluding Cooperative Banks) or from a schedule Foreign Bank as defined in Section 2(e) of RBI Act 1934 read with Second Schedule, drawn on and payable/ Extendable at a designated branch at Bangalore only.*
3. *The Scheduled Bank issuing the Bank Guarantee should preferably be on "Structure Financial Messaging System (SFMS)" platform. A separate advice of the BG shall preferably be sent by the issuing bank to the Employer's Bank through SFMS.*

   *The issuing Bank shall send the SFMS to:*
   *Name: BANGALORE METRO RAIL CORPORATION LTD.,*
   *Name of the Bank: BANK OF INDIA*
   *Branch: CANTONMENT BRANCH, BENGALURU.*
   *Account No: 840420110000760*
   *RTGS/IFSC: BKID0008404*

## Annexure – D

**INDEMNITY BOND**

[Refer SCC clause 8.2(b)]

THIS AGREEMENT is made on ……by and between BANGALORE METRO RAIL CORPORATION LIMITED, a company registered under the companies Act, 1956 and having its registered office at III$^{rd}$ Floor, BMTC COMPLEX, K.H ROAD, SHANTHINAGAR, BANGALORE-560 027 herein after referred to as the "OWNER" (which expression shall, unless excluded by or repugnant to the context or the meaning thereof, be deemed to include its successors and assigns) on the ONE PART

AND

M/s. …… having its registered office/principal place of business at …… (hereinafter referred to as the "CONTRACTOR"), which expression shall unless excluded by or repugnant to the context or the meaning thereof, be deemed to include its successors and assigns on the OTHER PART.

WITNESSETH THAT

WHEREAS, the Contractor submitted Tender for execution of the work of ……

…….. In accordance with the finally accepted Tender documents with necessary additions/alterations if any

AND

WHEREAS the Employer has accepted the said Tender submitted by the Contractor wherein the Contractor has agreed to execute the aforesaid work

AND

WHEREAS the Contractor has agreed to execute the work on the terms and conditions stated in the Contract Agreement executed on …… Clause 25.0 of General Condition of Contact of the said Contract Agreement provides for payment by Employer to the Contractor for execution of the work subject to submission of Indemnity Bond & Insurance.

Now, therefore, in consideration of the foregoing promises and mutual convenience herein contained, the Contractor hereby agrees as follows:

1. The materials brought to the site for executing the Contract, for which payment is made by the Employer to the Contractor shall stand hypothecated to the Employer without any further act.
2. The Contractor do hereby agree that it shall not hypothecate, alienate or create any encumbrance on the materials for which payment is released by the Employer.
3. The Contractor shall confirm and furnish a certificate that materials have been physically brought to and have not been incorporated in the work.
4. It shall be the responsibility of the Contractor to ensure that the materials are stored satisfactorily and are designated in stock. The Employer reserves the right to carry out physical verification by giving notice to the Contractor and the Contractor is bound to give all necessary details including records and invoices for carrying out verification. In the event of any discrepancy noticed by the

Employer, the Contractor do hereby undertakes to make good the losses within ……. days or as notified by the Employer.

5. The Contractor shall ensure that the quantities of stores tally with the quantities of the Contract items for which payment is released by the Employer.
6. The Contractor shall affirm that no materials advance has been paid earlier against the same materials.
7. The Contractor shall ensure that materials conform to the specifications and are of tested quality.
8. The Contractor shall not be entitled to draw / avail loan against the materials for which payment is released by the employer from Bank.
9. The Contractor shall also take Insurance Cover equivalent to the value of the materials for which payment is released by the employer.
10. The Contractor shall provide access to check / cross check the quality / quantity of materials prior to and after the payment.
11. The courts of Bangalore only shall have jurisdiction to deal with and decide any legal matter or dispute whatsoever arising out of this agreement.
12. All the parts of this Contract have been read and fully understood by us.

In witness whereof, the said Company and the Contractor have hereto set their respective hands, on the day, month and year first above written in the presence of the following witnesses:

Name of the Contractor :
Designation of authorized signatory :

Seal of the Contractor :

Witness:

1.……..…

2……..

**Annexure - E**

## TENDERER'S DECLARATION

I/We have inspected the site of works and have made this declaration that I am / we are fully acquainted with the local conditions in and around the site of works. I/We hereby declare that I/We have gone through the conditions laid down in the information for Tender. Conditions of Contract, Tender specifications, etc and understood the same and on the basis of the same, I/We quoted our rates in the schedule of Quantities attached with the Tender documents.

I/We shall also uniformly maintain such progress as may be directed by the Employer /Engineer to ensure completion of the same within target date as mentioned in the Tender document.

I/We declare that the submission of this Tender is being made by us and confirm that no agent, middleman or any intermediary has been, or will be engaged to provide any services, or any other item of work related to the award and performance of this Contract. We further confirm and declare that no agency commission or any payment which may be construed as an agency commission has been, or will be, paid and that the Tender price does not include any such amount.

I/We undertake to keep the process of Tender evaluation, price and other details confidential.

I/We also undertake to comply with various statutory Laws, Tax Laws, Environmental Laws and Safety measures in execution of the work.

I/We declare that if our Tender is accepted we understand that we are to be held solely responsible for the due performance of the Contract.

I we declare that we will treat as confidential all matters arising in connection with the Tender.

Signature of the Tenderer

Witness:

Address:

Seal of the Tenderer

**Annexure - F**

## UNDERTAKING BY THE TENDERER

(as per 2.6 & 18.1 of ITT)

*An undertaking to the effect to be given by the Tenderer*

1. We undertake that M/s _____ _____a reputed and certified Electrical Contractor with "_____ License" for doing the "Tendered Work" NOT been Black listed /Debarred by KPTCL / BESCOM or erstwhile KEB /BBMP / any Government / Government undertaking / semi Government / PSU / Govt. Controlled Institutions/projects/ Reputed private organizations in India or Abroad.
2. We also undertake that the Tender submittals does not contain any deviation, amendment, modification or change of any type whatsoever with regard to tender conditions and specifications.

Place: Signature

Date: Name and Designation

Seal of the Tenderer

**Annexure - G**

## WORK EXPERIENCE

Work completed of similar nature during the last five (5) years specified in ITT clause 2.3:

| Sl. No. | Project Name | Name of Employer | Description of Work | Contract Number | Value of contract (INR) | Date of issue of Work order | Stipulated date of completion | Actual date of completion | Actual value of work done (INR) |
|---|---|---|---|---|---|---|---|---|---|
| 1. | | | | | | | | | |
| 2. | | | | | | | | | |
| … | | | | | | | | | |

If any delay in completion of the work, the reasons for delay shall be explained for such work(s):
……..
……..

Place: Signature

Date: Name and Designation

Seal of the Tenderer

**Annexure – H**

## FINANCIAL ELIGIBILITY INFORMATION

1.1 The information to be filled in by the Tenderer hereunder will be used for purpose of computing **Tender capacity** as provided for in Clause 2.4 & 2.5 of the Instructions to Tenderers.

| | Description | Financial Year | Total Value of works carried out during the year (In INR) | Multiplication factor for work performed to 2022-23 level | Total value of Works updated to 2022-23 |
|---|---|---|---|---|---|
| 1.2 | Total value of works (*) executed and payments received year wise in the last five years (in Rs. Lakhs) # | **2017 - 18** | | 1.61 | |
| | | **2018 - 19** | | 1.46 | |
| | | **2019 - 20** | | 1.33 | |
| | | **2020 - 21** | | 1.21 | |
| | | **2021 - 22** | | 1.10 | |

** ---Value of similar work as defined in ITT Clause 2*
*# --- Attach Certificate from practicing Chartered Accountant.*

1.3 Information on works which are yet to be completed and works for which Tenders have been submitted as on date of this Tender.

(A) Existing commitments and on-going works:

| Description of Work | Place & State | Contract No. & Date | Name and Address of Employer | Value of Contract (Rs. Lakh) | Stipulated period of completion | Value of works[1] remaining to be completed (Rs. Lakh) | Anticipated date of completion |
|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

[1]Attach Certificates duly attested by the Employer or Engineers-in-Charge, of the on-going works.

B) Works for which Tenders already submitted:

| Description of Work | Place & State | Name and Address of Employer | Estimated value of works (Rs. Lakh) | Stipulated period of completion | Date when decision is expected | Remarks if any |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | | | | | |
| | | | | | | |

Place: Signature

Date: Name and Designation

Seal of the Tenderer

**Annexure – I**

## Contractor's Equipment/Machinery Details

Details of Equipment/Machinery considered essential and to be deployed by the Contractor for successfully carrying out the works, as per ITT clause 2:

| Sl. No. | Item of Equipment | Requirement[1] | | Owned and available | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | No. | Capacity | Number/ Capacity | Age/ Condition | Owned or Hired | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Place: Signature

Date: Name and Designation

Seal of the Tenderer

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# PART-B

# TECHNICAL SPECIFICATIONS

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# PART-B

## TECHNICAL SPECIFICATIONS

1. GENERAL ----------105
2. EARTH WORK ----------108
3. BEDDING----------111
4. BACK FILLING----------111
5. DUCTILE IRON PIPELINE----------113
6. MILD STEEL PIPELINE----------119
7. ANCILLARY STRUCTURES----------143

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# 1. GENERAL

## 1.1 Scope of Work.

The scope of work under this Contract includes the following:

1.1.1 Providing & Laying of 300 mm dia & above MS pipes with linking.

1.12 Manufacturing, Providing, transporting, testing, laying & commissioning of 300mm dia & above MS pipeline with allied works.

1.1.3 Earthwork in all kinds of soil, hard rock. The pipeline is to be laid in the developed city roads with traffic

1.1.4 Fixing and connecting all pipelines fixtures like valves, bends, tees and other specials as specified in the construction drawings, construction all appurtenant structures such as pipe supports, valve chambers, thrust blocks, etc.,

1.1.5 Backfilling the trenches, restoring and making good all surfaces which are damaged during excavation.

1.1.6 Dismantling and reconstruction of structures such as culverts, storm water drains, roads etc., and utility lines such as water supply pipe lines, sewer lines coming in the way of the pipeline alignment.

1.1.7 Testing and commissioning of the pipe line after laying.

1.1.8 Maintenance of all the pipelines for 12 months after commissioning. During this period, the contractor has to set right the defect of any kind in the manufacture, laying and jointing of all the pipelines and in the other works in this scope of tender.

1.1.9 All work shall be done as per the specifications. The works shall include providing all materials, equipments, labour, tools, plants, transport etc., and all other services necessary for the complete construction including necessary sub-soil investigations.

1.20 The alignment of the pipeline and other typical details of pipe bedding, valve chambers, thrust blocks, pipe supports, and the general arrangement of reservoir are furnished in Drawings. Further details shall be furnished in the construction drawings during the construction stage if found necessary.

## 1.2 Royalties

1.2.1 The Employer shall deduct Royalties on materials used in the Works from the progress payments to the Contractor at the rates specified in the most recent “Amendment to the Karnataka Minor Minerals Concession Rules - 1969” as published by the Commerce and Industries Department (Mines) and as illustrated in Annexure-1, attached.

## 1.3 Site Order Book

1.3.1 The Contractor shall maintain an identical pair of Site Order Books (one marked original and the other marked duplicate), at the Site at all times during the execution of the Works for the use of the Engineer and the Contractor. All instructions issued by the Engineer to the Contractor shall be recorded in both sets of the Site Order Book and shall be signed by the issuer and countersigned by the Contractor. After compliance with the instruction, the Contractor shall record the same in both sets of the Site Order Book duly signed and countersigned by the Engineer. Acceptance of any part of the work executed by the Contractor shall be subject to verification with respect to compliance of respective instructions of the Engineer through the Site Order Book. The Engineer shall retain the original copy of the Site Order Book, while the Contractor shall retain the duplicate one.

## 1.4 Quarry Materials

1.4.1 The Contractor shall be wholly responsible to identify the suitable sources for quarry materials required for the Works, such as earth, sand, stone, muram, etc., and to make his own arrangements for collection and transportation of the materials irrespective of the leads and lifts required. The quarry thus identified by the Contractor should have proper license from the Government of Karnataka. All materials supplied by the Contractor shall satisfy the requirements set forth in the Specifications and shall be subject to the approval of the Engineer. The Contractor shall take this into account while offering his rates and no claims whatsoever shall be entertained for extra costs on this account.

### 1.5 Inspection and testing

1.5.1 Inspection of Material to be procured

Inspection and certification of all materials used on the works such as MS Plates / Pipes and Specials , Valves, Cement, Size Stones, Sand aggregate, Lead, Rubber gaskets etc., for conformity with specifications of BIS. If insisted, inspection of materials at the manufacture place shall be arranged by the contractor at his cost including the travelling and accommodation of the inspecting officer.

1.5.2 **Inspection and certification of the various components of works.**

Construction of pipeline with all fixtures, construction of Valve Chamber including back filling of trench in layers with compaction as specified to ensure that all components of works are carried out as per specification and to required standards.
Inspection & Certification of Hydraulic Test on Completed pipe line in reaches as specified.

### 1.6 Technical Specifications

1.6.1 Engineer shall have the right to modify/alter the Particular Specifications and/or Standard Specifications at any time which promise to confer equal or better quality than the standard specified in the tender document. Such modification or alteration shall be acceptable to the Contractor subject to no additional financial burden to either the Contractor or the Employer.

### 1.7 Storage of Materials and Plant

1.7.1 The Contractor shall provide appropriate storage facilities for materials like cement, steel, aggregates, consumable supplies, equipment, mechanical and electrical items, etc., and shall take all safety and security measures against theft and deterioration in quality, at his own cost.

### 1.8 Procurement of Materials:

1.8.1 CEMENT:

The Contractor shall use only 43 grade cement conforming to IS 8112 / 89 with latest amendments with ISI mark. The Contractor should furnish the manufacturer test certificate for the above brand of cement for having manufactured the cement as per relevant BIS and guarantee certificate before using the cement.

1.8.2 STEEL:

The Contractor shall procure the steel from VISL / SAIL / VSP / TISCO and manufacturers' test certificate is to be produced.

### 1.8.3. MS PIPES, VALVES AND OTHERS

| Sl.No. | Description | Make |
|---|---|---|
| 1 | Sluice Valves Conforming to IS 14846/2000 | KIRLOSKAR, IVI, FOURESS, DURGA, JASH, JUPITER, BSJ, SHAU, UPADYAYA, CALSEN |
| 2 | Butterfly valves – Conforming to IS 13095 / 1991 | KIRLOSKAR, FOURESS, IVI, DURGA , L & T, JASH |
| 3 | MS plate/HR coil to Manufacture MS pipes Conforming to IS: 2062 | SAIL, TISCO,ESSAR STEEL, ISPAT Industries, |
| 4 | Kinetic Air Valves | KIRLOSKAR, IVI, BSJ, SHAU, DURGA, CALSEN, |
| 5 | Double Ball Kinetic Air Valves | KIRLOSKAR, IVI, BSJ, SHAU, DURGA |
| 6 | Bolts, Nuts and Washers | GKW, TEXSO MAKE, T.V.S. UNBRAKO |

(Any other reputed make as may be approved by BWSSB at a later date by producing the credentials.)

The above branded makes are preferred. In the bid the bidder should specify the make for which the rate is quoted without which the Board can specify any make among the above brands.

**1.9 Equivalency of Standards and** be procured, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise stated in the Contract. Where such standards and codes are national, or relate to a particular country or region, other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be acceptable subject to the Engineer's prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the Engineer at least 28 days prior to the date when the Contractor desires the Engineer's approval. In the event the Engineer determines that such proposed deviations do not ensure equal or higher quality, the Contractor shall comply with the standards specified in the documents.

**1.10 Sign Board**

1.10.1 The Contractor shall provide a sign board at the site of the Works of approved size and design which provides (i) the name of the Project (ii) the names and addresses of the Employer, the Contractor and the Consultant; (iii) the name and short description of the Project, (iv) the amount of the Contract Price ; and (v) the starting and completion dates.

**1.11 Samples and Tests**

1.11.1 The Contractor shall be responsible to develop a quality control program and to provide all necessary materials, apparatus, instruments, equipment, facilities and qualified staff for sampling, testing and quality control of the materials and the works under the Contract. Without limiting the generality of the foregoing, the Contractor shall either (i) establish a testing laboratory at the site of Works which is adequately equipped and staffed to carry out all sampling and testing in accordance with the requirement set out in the General Specifications and/or these Special Specifications and provide all field equipment and apparatus as necessary to conduct all specified in-situ tests and/or any Tests on Completion, provided the correctness of the equipments are ensured or (ii) arrange for routine sampling, testing and reporting, as required, through a certified independent testing laboratory acceptable to the Engineer. All costs of such sampling, testing and reporting of test results will be borne by the Contractor, and the Contractor shall include sufficient provisions in his tendered rates to allow for independent sampling and laboratory testing under the direction of the Engineer up to 5% of the required tests at no additional cost. The Contractor shall furnish certified copies of all test reports to the Engineer within 3 days of completion of the specified tests.

1.11.2 The Contractor shall, within 14 days after the date of the Letter of Acceptance, submit to the Engineer for his consent a detailed description of the arrangements for conducting the quality control programme during execution of the Works, including details of his testing laboratory, equipment, staff and general procedures. If following submission, or at any time during the progress of Works, it appears to the Engineer that the Contractor's quality control programme is not adequate to ensure the quality of the Works, the Contractor shall produce a revised programme which will be adequate to ensure satisfactory quality control.

**1.12 Protection of Utilities**

1.12.1 The Contractor is required to carefully examine the location of the Works and their alignments and to make special enquiries with all authorities concerning all utility lines such as water, sewers, gas pipe, telephone (underground and/or overhead) lines, electric cable (underground and/or overhead) lines, etc.; and to determine and verify to his own satisfaction the character, sizes, position and lengths of such utilities from authentic records. The Contractor shall be wholly responsible for the protection and/or facilitating relocation of such utilities as may be required, and shall not make any claim for extra work or extra time that may be required to protect or facilitate relocating such utilities. If any major shifting or realignment of water, sewers, gas pipes, electric and telephone lines is necessary due to their interference with the proposed Works, the same may be done by the Employer. The cost of such relocation will be borne by the Employer. In case the alignment of the pipeline crosses high tension electrical transmission lines belonging to the Karnataka Power Transmission Corporation Ltd. (KPTCL) or other authorities, the Contractor shall take all precautions necessary to see that the work is carried out with care and safety, without disturbing such transmission lines. The Contractor will be responsible to carry out all construction activities in such reaches in consultation with the owners of such facilities. However, satisfactory completion of the entire work will be the responsibility of the Contractor.

## 2. Earth Work

### 2.1 GENERAL:

2.1.1 The earth work excavation for laying of pipe shall be carried out. The Contractor shall make all excavations required for laying and jointing of the pipeline and construction of pertinent structures as required in the project. Except where otherwise required by the project or instructed by the Engineer, all excavation shall be in open cut to the specified widths and depths. The Contractor is advised to satisfy himself with regard to the likely conditions that may be met with during the execution of the Works, with regard to the underground obstructions or conditions, necessary dewatering requirements etc. Before commencing the earth work, the Contractor shall carry out detailed survey of the proposed alignment, prepare construction drawings showing the longitudinal section of the ground profile, locations of valves and other appurtenances and submit to the Employer for approval.

### 2.2 CLASSIFICATION OF EXCAVATION

All materials involved in excavation shall be classified in three categories as follows:

2.2.1 **Ordinary soil:** This includes excavation in all types of soil including soil containing gravels, murums, loose boulders, viz., ordinary gravely soil, hard gravely soil, wet soil, stiff slushy soil, chettu soil and calcareous strata, but exclusive of disintegrated rock, soft rock/shale;

2.2.2 **Soil Containing Disintegrated Rock, Soft Rock and Soft Shale:** This category includes excavation in soil containing disintegrated rock, soft rock or soft shale which can be cut by shovel and no hand or mechanical chiseling is required.

2.2.3 **Medium Hard Rock:** This category includes excavation in lime stone, sand stone, hard shale and schist fissured rock, without resorting to blasting.

2.2.4 **Hard Rock:** This category includes excavation in hard rock requiring hand or mechanical chiseling or blasting. In case of difference in opinion between the classification of rock requiring blasting and that requiring chiseling, wedging, the site of work shall be inspected by the engineer and the decision of the Engineer shall be final and binding on the Contractor.

### 2.3 LIMITATION OF EXCAVATION

2.3.1 The trench for laying MS Spiral welded pipes shall have minimum width as per standards stipulated or as directed by the Engineer-in-charge. A minimum earth cover of 1.2 m shall be maintained above the pipe top, unless otherwise specified or shown in the alignment drawings.

2.3.2 The Contractor shall be responsible to ensure that the widths and depths of the trenches do not exceed the limits shown in the construction drawings. Should the excavation occur beyond the dimensions specified therein, because of the negligence of the Contractor, the Contractor shall fill the excess space with granular material or concrete as directed by the Engineer. Nothing extra shall be paid to the Contractor on account of this.

### 2.4 TRAIL PITS

2.4.1 Trial pits may be dug by the Contractor, without being directed to do so, along the alignment as shown on the drawings in advance of the excavations for the purpose of satisfying himself as to the location of underground obstructions or soil conditions.

### 2.5 SLIPS AND SLIDES

2.5.1 The Contractor is responsible for proper protection of excavations made by him from any slips and slides. All slides and caving shall be handled, removed or corrected by the Contractor without any extra compensation at whatever time and under whatever circumstances they may occur. The excavations shall be made good and brought to necessary depth, width and levels without any extra cost.

### 2.6 STCKING OF EXCAVATED MATERIALS

2.6.1 The excavated material shall be stacked on the sides of the trench wherever possible. Wherever it is not possible to stock on the sides of the trench, contractor has to find the place nearby for stocking the excavated material and cart the materials to & fro. Rate for this shall be included in the earthwork itself and no extra rate will be paid for this.

2.6.2 Surplus earth is to be disposed off to a place identified by the contractor approved by the engineer. There is a item for this work and will be paid accordingly.

**2.7 Safety measures**

The Contractor shall provide adequate safety measures during excavation. They shall include:

1. Barricading all sides of the open trenches.
2. Red danger lights which can be easily visible from dusk to dawn placed at an interval of 20 m.
3. Traffic signals and display boards giving direction for diversion of traffic at the appropriate places as may be directed by the Engineer.
4. Adequate safe wooden plank / board or steel plate over the trenches to facilitate crossing by the public residing on either side of the trench.
5. Round the clock watch and ward maintaining all safety regulations at the site of work and protecting the site from unauthorised intrusions.

**2.8 Progress of Excavation of pipe trenches**

The Contractor shall adjust excavation of trenches in such lengths that the pipes can be laid in such exposed portion of the trench within 2 days.

**2.9 Shoring and Bracing**

The Contractor shall supply, fix and maintain necessary sheathing, shoring and bracing etc., in steel or wood, as may be required to support the sides of the excavation, to protect workmen in the trench and to prevent any trench movement which might any way injure or delay the work, change the required width of the trench, make unsafe condition for adjacent pavements, utilities, buildings or other structures above or below ground.

Sheathing, shoring and bracing shall be withdrawn and removed as the backfilling is being done, except when the Engineer may agree that such sheathing, shoring and bracing be left in place, at the Contractor's request. In any case, the Contractor shall cut off any such sheathing at least 600 mm below the surface and shall remove the cut off material from the trench.

All sheathing, shoring and bracing which are left in place under the foregoing provisions shall be removed in a manner so as to not endanger the completed work or other structures, utilities or property, whether public or private.

**2.10 EXCAVATION**

2.10.1 Excavation in Rock

Excavation in rock shall be carried out to a depth, 150 mm more than the bottom level of pipe and to a width equal to the diameter of the pipe plus minimum working space on either side as given in drawing. Unless otherwise directed by the Engineer, rock excavation shall be progressed at least by 50 m in advance of the pipe length proposed to be laid.

2.10.3 Excavation for Valve Chambers and Other Appurtenant Structures

The Contractor shall excavate as required for all structures with foundations to firm, undisturbed earth up to the level of the under side of the structure. If the excavation is in rock, the Contractor shall excavate all rock at least to the minimum limits shown on the standard details for trenches and to the grade of the bottom of inlets, junction chambers or other structures as required. Where the bottom of the structure is in rock, it should be ensured that no rock shall project above the lower surface of the concrete in such a manner so as to reduce the required thickness of concrete placed simultaneously as an integral part of the foundation and to the outside of structure foundation where structure is to be built. The Contractor shall excavate the trench / pit to provide necessary working space on all sides and for accommodating any sheathing, shoring or bracing etc.

**2.11 Contractor's Responsibility**

The Contractor shall be responsible for the adequate pumping, drainage and bailing out water from the excavated trench. In case of failure to make such provisions or any other provisions which may result in unsuitable sub-grade conditions, the Contractor shall replace and repair the sub-grade as directed to the satisfaction of the Engineer, at his own cost and responsibility.

Should the Contractor select to use a gravel sub-grade to facilitate flow of water to pumps or other points of disposal, such gravel sub-grade shall not be measured or paid for as an extra item.

**2.12 Works Included in Excavation**

The following works as per specifications are also included in excavation and the term 'Excavation' shall construe to mean all such items of work. The quoted rates should include the same:

1. Provision of side space or additional space in the trench/pit for working and/or accommodating sheathing, shoring, bracing, etc.
2. Supply, installation and removal after the work, all sheathing, shoring and bracing required to protect the excavation where required or where such work is recommended by the Engineer.
3. Protection of excavations.
4. Providing adequate safety measures.
5. Additional work in connection with overhead wires and poles.
6. Excavation for Socket hallows.
7. Supplying and fixing of sight rails and boning rods in the trench to facilitate measurement of work.

**2.13 Measurement and Payment for Excavation**

2.13.1 For Excavation

The measurement for excavation shall be considering the allowable widths, depths with allowed side slopes (if any) for different classes of soils as per approved classification. The measurement for excavation shall be based on "neat line" dimensions as specified in the drawing or Specifications, for different types of soils and depth of excavation. The total volume of excavation shall be computed as a square bottomed trench of width equal to the outer diameter of the pipe, with minimum working space as given in the drawing, added to it, length up to the length of the trench being measured. The depth of trench being average depth taken at 30 m intervals, between the level of bottom of trench and the original surface of the ground. The length of the trench shall be measured as per the actual length of pipes and fittings / specials laid at work site. However depth shall be measured at closure intervals at vulnerable places. The volume of excavation for structures like valve chambers, thrust blocks and anchor blocks etc., shall be computed and measured for payment as per the bottom area of the particular structure on outer periphery multiplied by the average depth between the level of the finished bottom of the structure and the original surface of the ground. The quantity shall be measured in cubic meters correct to two decimal places. The method of measurement for excavation in different classes of soils shall be as follows:

2.13.2 In Ordinary Soil and Soil Mixed with Disintegrated Rock and Soft Rock / Shale

In this category of soils, the excavation quantity shall be computed as specified above.

2.13.3 In Hard rock

In case of hard rock requiring chipping or chiseling, measurements shall be taken prior to and after chiseling and the volume of rock excavation shall be measured based on this difference. The excavation in rock shall be paid on stack measurements with a deduction of 40% in volume for voids.

2.13.4 For Excavation in Combination of Ordinary Soil, Disintegrated Rock, Soft Rock/Shale and Hard Rock/Schist

Wherever the excavation is undertaken in combination of ordinary soil, disintegrated rock, soft rock /shale and hard rock, the hard rock part shall be measured and paid, the soil part shall be measured and paid for the total measurable excavated quantity deducting the quantity measured for the hard rock. The total computed volume of excavation shall be equal to the sum of the computed volumes for each category of excavation undertaken.

**2.14 Protection of Utilities**

The Contractor is required to carefully examine the location of the Works and their alignments and to make special enquiries with all authorities concerning all utility lines such as water,

sewers, gas pipe, telephone (underground and/or overhead) lines, electric cable (underground and/or overhead) lines, etc.; and to determine and verify to his own satisfaction the character, sizes, position and lengths of such utilities from authentic records. The Contractor shall be wholly responsible for the protection and/or facilitating relocation of such utilities as may be required, and shall not make any claim for extra work or extra time that may be required to protect or facilitate relocating such utilities. If any major shifting or realignment of water, sewers, gas pipes, electric and telephone lines is necessary due to their interference with the proposed Works, the same may be done by the Employer. The cost of such relocation will be borne by the Employer.

In case the alignment of the pipeline crosses high tension electrical transmission lines belonging to the Karnataka Power Transmission Corporation Ltd. (KPTCL) or other authorities, the Contractor shall take all precautions necessary to see that the work is carried out with care and safety, without disturbing such transmission lines. The Contractor will be responsible to carry out all construction activities in such reaches in consultation with the owners of such facilities. However, satisfactory completion of the entire work will be the responsibility of the Contractor.

## 3. BEDDING

### 3.1. Bedding for the pipe

Bedding shall be provided all along the stretch of the pipe line, which differs based on the area through which the pipe line passes. However, the type of bedding to be provided shall be as decided by the Engineer.

### 3.2 Earth Bedding

The pipes shall be placed on the natural, undisturbed earth bedding, which has been carefully shaped to fit the lower part of the pipe for a width of at least 50 % of its external diameter. The trench shall be excavated to an extra breadth and depth, wherever weld joints are coming. Filling and removing earth or similar materials beneath the pipe to adjust with the grade will not be permitted except filling with compacted granular bedding material or murrum.

### 3.3 Gravel Bedding

Wherever rock is met with, it shall be removed up to 150 mm below the bottom level of the pipe to a minimum width equal to the width of the trench and the resulting space shall be filled up with good quality compacted gravel. The granular material shall be filled in the trench up to the level of ¼ the outer diameter of the pipe line, above the bottom of trench and well compacted. Unless otherwise directed by the Engineer, rock excavation shall progress at least 20 m in advance of the pipe length proposed to be laid.

### 3.4 Measurement for bedding:

The Contractor shall include the cost of earth bedding required for the pipeline in the tendered rate for pipe laying, for providing gravel bedding. The surplus quantity of excavated earth shall be disposed off. The quantity shall be measured in cubic meter correct to two decimal points.

## 4. BACK FILLING

### 4.1 General

The Contractor shall use selected surplus spoils from excavated materials for backfilling. All fill material shall be subject to Engineer's approval. The excavated materials suitable for backfilling shall be stored not closer than 600 mm from the edge of the trench and shall not obstruct any public utilities or interfere with travel by local inhabitants or general public. Handling and storage of excavated materials must meet with the regulations of the Local Government Authorities. The detailed specifications for backfilling shall be as per Clause 8 of IS: 3114-1994 and Clause 4.11 of IS 12288-1987.

### 4.2 Method of Backfilling

Trenches and excavated pits for structures shall be backfilled to original ground level or to such other levels, as the Engineer may direct. All backfilling shall be carried out in orderly manner expeditiously and consistent with good workmanship.

4.2.1 Backfill material put into the trenches/pits for backfilling, shall unless otherwise specified be compacted and built up as to minimise future settlement as much as is reasonably possible. For this, care shall be exercised in selecting backfill material free from large hard clay lumps, especially in cramped areas directly adjoining the walls of structures.

4.2.2 Backfilling in trenches shall be done as pipe laying progresses, with the permission of the Engineer, after the pipe or conduit is properly bedded, jointed and inspected and all measurements for the location of Y-Junctions, tees, etc., are properly recorded by the Engineer and sufficient time is allowed for the joint materials or cement concrete or mortar to set. However the joints shall be left open for inspection during testing, which shall be backfilled after successful completion of testing, after obtaining permission from the Engineer. Backfilling around and over the pipe, conduit, or structure shall be taken up uniformly on all sides and in the sequence and manner specified hereinafter, with care to avoid the displacement or damage to the pipe, conduit or structure. For the purpose of backfilling, the depth of trench shall be divided into the following three zones measured from bottom to top of trench, as follows:

i. Zone A : From bottom of trench to the centre line of pipe,
ii. Zone B : From the level of centre line of pipe to a level of 300 mm above the top of pipe,
iii. Zone C : From a level of 300 mm above the top of pipe to the top of trench.

4.2.3 Backfilling in the trenches and around structures shall be carried out in horizontal layers of uniform thickness of not more than 150 mm when measured loose. As may be necessary to attain maximum compaction, the backfill material shall be moistened by sprinkling with water. After placing each layer of backfill material, the layer shall be thoroughly and uniformly compacted by means of mechanical or hand tampers. The compacting equipment and the manner of its use shall be subject to the approval of the Engineer.

4.2.4 After the backfill material is placed in Zone A and Zone B as specified above, the remaining portion i.e., Zone C of the trench may be machine backfilled. Even in this case the backfill material shall be placed in uniform horizontal layers of not more than 150 mm thickness. Small pebbles of size less than 50 mm, if any, shall be so distributed throughout the mass, that all interstices are solidly filled with fine material. The backfill material shall be tamped with mechanical tamping equipment, after moistening the backfill by sprinkling with water to obtain maximum compaction (min 95% proctor density).

4.2.5 Machine backfill shall be so conducted that the material deposited in the trench shall not fall directly on top of the pipe from such a height as might result in damage to the pipe joints or alignment.

4.2.6 If the trench is subjected to conditions which might cause flotation of the pipe before sufficient backfill has been placed, the Contractor shall take the necessary precautions to prevent floatation of the pipe, conduit or structure.

4.2.7 Before final acceptance of the work, additional tamped earth shall be added to restore the settled trench surface to the required level of the adjacent earth surface or to the base of crushed rock wearing surface or to the finished earth base.

4.2.8 If from the excavated soil, enough backfill material is not available, imported, selected and approved backfill material from the borrow pits is required to be placed for backfill, on approval of the Engineer backfilling of trenches where the excavation is in the rock shall be with the surplus soft soil, with all lead and lift.

4.3 Disposal of Surplus Excavated Material

The excavated material which is in surplus to the requirements after backfilling shall be removed and spread at places shown by the Engineer, with all lead and lift from the site of work, for which payment shall be made as per the quoted rates. No surplus or excess material shall be disposed in a stream / channel or in any place where the pre-construction surface drainage may have to be provided, without written permission of the Engineer.

## 5. DUCTILE IRON PIPELINE

### 5.1 Scope

This specification covers the requirements for manufacturing, supplying, laying, jointing, testing and commissioning of Ductile Iron pipeline and fittings including associated civil works required for the same.

### 5.2 Standards

The following specifications, standards, and codes are part of this specification. All standards, specifications and codes of practice referred herein shall be the latest edition including all applicable official amendments and revisions.

In case of discrepancy between this specification and those referred to herein, this specification shall govern,

| | |
|---|---|
| **IS:8329** | **Centrifugally Cast (Spun) ductile Iron Pressure pipes for water, gas and sewage.** |
| IS:638 | Sheet rubber jointing and rubber insertion jointing. |
| IS:1387 | General requirements for supply of metallurgical materials**.** |
| IS:1500 | Methods for Brinell Hardness test for metallic materials. |
| IS:9523 | Ductile Iron fittings for pressure pipes for water, gas and sewage. |
| IS:12820 | Dimensional requirements of rubber gaskets for mechanical joints and push on joints for use with cast iron pipes and fittings for carrying water, gas and sewage. |
| ISO:4179 | Ductile iron pipes for pressure and nonpressure – Centrifugal cement mortar lining – General requirements. |
| ISO:2531 | Ductile iron pipes, fittings and accessories for pressure pipe lines. |
| IS:5382 | Specification for Rubber Sealing rings for Gas mains, water mains and sewers. |
| AWWA C600 | Installation of ductile iron water mains and their appuratenances. |
| IS:11906 | Recommendations for cement-mortor lining for cast iron, mild steel and ductile iron pipes and fittings for transportation of water. |
| IS:3764 | Excavation work – code of safety. |
| IS:12288 | Code of practice for use & laying of Ductile iron pipes. |
| IS:460 | Test sieves – Part I |
| IS:8112 | Specification for 43 Grade Ordinary Portland Cement. |
| BS 3416 | Bitumen based coatings for cold application, suitable for use in contact with potable water. |
| BS EN 545 | Ductile iron pipes, fittings, accessories and their joints for water pipelines – requirements and test methods. |
| ISO 81790 | For zinc coating. |

### *5.3. Manufacture of pipe*

DI pipes and fittings (Class K7 & K9) shall be in accordance with IS: 8329 and IS: 9523. Pipes and fittings shall be procured from reputed manufacturers with Engineer's approval. Engineer shall at all reasonable times have free access to the place where the Pipes and fittings are manufactured for the purpose of examining and testing the pipes and fittings and for witnessing the test and manufacturing.

All tests specified either in this specification or in the relevant Indian Standards specified above shall be performed by the Manufacturer / Contractor at his own cost and in presence of Engineer if desired. For this, sufficient notice before testing of the pipes and fittings shall be given to Engineer.

If the test is found unsatisfactory, Engineer may reject any or all pipes and fittings of that lot. The decision of Engineer in this matter shall be final and binding on the Contractor and not subject to any arbitration or appeal.

The pipes and fittings shall be stripped, with all precautions necessary to avoid warping or shrinking defects. The pipes and fittings shall be free from defects. Any defect in pipes and fittings in the opinion of Engineer shall be rejected and shall be replaced by new one.

In the case of spigot and socket pipes and fittings, the socket shall be without the centre ring.

In the case of flanged pipes, the flanges shall be at the right angles to the axis of the pipe and machined on face. The bolt holes shall be drilled and located symmetrically off the centre line. The bolt hole circle shall be concentric with the bore and bolt holes equally spaced. The flanges shall be integrally cast with the pipes and fittings and the two flanges of the pipe shall be correctly aligned.

**a). Materials**

The materials used in the manufacture of pipes and fittings shall comply with requirements specified in IS: 8329 - 2000 and IS: 9523 - 2000.

**b). Dimensions and Tolerances**

The internal diameter, thickness and length of barrel, dimensions of pipes and fittings shall be as per relevant tables of IS: 8329/IS: 9523 for different class of pipes and fittings. Pipe of standard length of 6m is recommended and other properties for pipes and fittings shall be as per IS: 8329/IS: 9523. Each pipe shall be of uniform thickness throughout its length.

The tolerances for pipes and fittings regarding dimensions, mass, ovality and deviations from straight line in case of pipes shall be as per IS: 8329/IS: 9523.

## 5.4 Testing

(a) **Mechanical tests**

Mechanical tests shall be carried out during manufacture of pipes and fittings as specified in IS: 8329/IS: 9523. The frequency and sampling of tests for each batch of pipes shall be in accordance with IS 8329. The tests results so obtained for all the pipes and fittings of different sizes shall be submitted to Engineer. The method for tensile tests and the minimum tensile strength requirement for pipes and fittings shall be as per IS: 8329/IS: 9523.

**(b) Brinell Hardness Test**

For checking the Brinell hardness, the test shall be carried out on the test ring or bars cut from the pipes used for the ring test and tensile test in accordance with IS 1500. The test shall comply with the requirements specified in IS 1500/IS 8329.

**(c) Retests**

If any test piece representing a lot fails in the first instance, two additional tests shall be made on test pieces selected from two other pipes from the same lot. If both the tests results satisfy the specified requirements, the lot shall be accepted. Should either of these additional test pieces fail to pass the test, the lot shall be liable for rejection.

**(d) Hydrostatic Test**

For hydrostatic test at works, the pipes and fittings shall be kept under test pressure as specified in IS 8329/IS9523 for a period of minimum 15 seconds, during which the pipes shall be struck moderately with a 700 g hammer for conformation of satisfactory sound. They shall with stand the pressure test without showing any leakage, sweating or other defect of any kind. The hydrostatic test shall be conducted before surface coating and lining.

During manufacture, tests on pipes shall be carried out in accordance with **clause 1.2.8 of this Technical specification** by the Third party inspecting agency.

## *5.5 Jointing of pipes*

**(a) General**

Jointing of DI pipes and fittings shall be done as per IS: 12288 and manufacturer's recommendations. After jointing, extraneous material, if any, shall be removed from the inside of the pipe. Rubber sealing rings/gaskets used for jointing shall conform to IS: 638, IS: 12820 and IS: 5382.

**(b) Spigot and Socket joints**

These shall have sockets, which are integral with the pipe and incorporate an electrometric rubber ring gasket conforming to IS: 12820.

The gaskets/sealant used for joints shall be suitable for water conveyance. In jointing DI pipes and fittings, the Contractor shall take into account the manufacturer's recommendations as to the methods and equipment to be used in assembling the joints. In particular the Contractor shall ensure that the spigot end of the pipe to be jointed is smooth and has been properly chamfered, so that the rubber ring as per IS: 12820 and IS: 5382 is correctly positioned in line, before the joint is made. The rubber rings and any recommended lubricant shall be obtained only through the approved supplier and as directed by the Engineer.

**(c) Gaskets for Flanges**

All gaskets used between flanges of pipes shall be of natural rubber conforming to IS: 638 of thickness 3 mm suitable for waste water conveyance and as specified by manufacturer.

**(d) Flanged joints**

These shall be of PN 1.0 rating and shall comply with dimensions and drilling details as specified in IS: 8329. These shall have isolation gaskets between the flanges, isolation sleeves around all bolts and isolation washers under all bolt heads and nuts. All material shall be supplied by a reputed manufacturer and shall be approved by the Engineer.

Each bolt should be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively. The recommended bolting torque to be followed for assembling flanges shall be as specified in manufacturer's instructions. The practice of fully tightening the bolts one after another is highly undesirable. The bolts shall be of mild steel unless otherwise specified. They shall be coated with coal tar epoxy coating after tightening.

## 5.6 Specials

Standard DI fitting shall be in accordance with IS:9523. Wherever standard DI specials are not available, they shall be manufactured and tested as per requirements with the approval of Engineer.

## 5.7 Coatings

**i) General**

Unless otherwise specified, DI pipes and fittings shall be coated with Bitumen in accordance with relevant IS specifications. All buried DI pipes and fittings shall also have factory or site applied polythene sleeving. Coating shall not be applied to pipe and fittings unless its surface is clean, dry and free from rust. Pipe coatings shall be inspected at site and any damage or defective areas shall be made good to the satisfaction of the Engineer.

**ii). Bitumen coating**

Bitumen coating shall be of normal thickness of 75 microns unless otherwise specified. It shall be cold applied compound complying with the requirements of relevant Indian standards, suitable for tropical climates, factory applied in accordance with the manufacturer's instructions.

Damaged areas of coating shall be repainted on site after removing any remaining loose coating and wire brushing any rusted areas of pipe.

**iii). Cement mortar lining**

All pipes and fittings shall be internally lined with cement mortar in accordance with relevant IS. The cement used shall be Sulphate Resisting Cement confirming to IS: 12330. No admixtures in the mortar shall be used without the approval of the Engineer. The curing shall commence immediately after completion of the

mortar lining, shall not be later than 8 hours after mixing of mortar. The lining shall be kept continuously in moist condition for a period of minimum 14 days.

Pipe linings shall be inspected on site and any damage or defective areas shall be made good to the satisfaction of the Engineer.

Lining shall be uniform in thickness all along the pipe. The minimum thickness of factory applied cement mortar lining shall be as per IS: 11906.

**5.8. Marking**

Marking shall be done as per IS: 8329 and IS: 9523 or any other relevant IS codes approved by the Engineer. The following information shall be clearly marked on each pipe,

a). Internal diameter of pipe.
b). Class of pipe.
c). Date of manufacture and
d). Name of manufacture or his registered trade-mark or both.

**5.9. Carting & Handling.**

Carting and handling of D.I. pipes and fittings shall be in accordance with the clause 3.4. of GSW pipes specifications.

**5.10. Trenching.**

Trenching includes all excavation which shall be carried out either by hand or by machine and shall be carried out in accordance with all requirements of part-2 Earth work excavations clause 2.0 to 2.17.wherever a socket or collar of pipe or fitting / special occurs, a grip is to be cut in the bottom of the trench or concrete bed to a depth of at least 75 mm below the bed of the pipe so that the pipe may have a fair bearing on its shaft and does not rest upon its socket. Such grip shall be of sufficient size in every respect to admit the hand all round the socket in order to make the joint, and the grip shall be maintained clear, until the joint has been approved by Engineer.

Wherever D.I. pipes are laid over pillar supports for nala crossings etc. the pipes shall be placed as per the construction drawings and as directed by the Engineer In-charge.

The width of the trench shall be kept to a minimum consistent with the working space required and having regard to the safety of the trench, the method of laying and jointing the pipe and the need to avoid damage to pipe coating and so as to provide the minimum horizontal clearance as stated in the table below. The bottom of the trench shall be properly trimmed to permit even bedding of the pipeline.
The portion of the trench which extends from the formation level to not less than 300 mm above the crown of the pipe when laid in its correct position, shall, unless otherwise specified or ordered by the Engineer, be formed with vertical sides. The clearance between the sides and bottom of the trench and the barrel of the pipe shall not exceed the following, inclusive of any allowances required for temporary trench supports:

| Pipe Nominal Bore (mm) | Bottom Clearance (mm) | Side Clearance (mm) |
|---|---|---|
| 350 to 600 | 200 | 300 |
| > 600 to 800 | 200 | 350 |

The clearance at joints may be increased to allow the joints to be made and inspected, any proposed increase shall be approved by the Engineer.
All trenches deeper than 1.2 m shall have the trench walls battered or supported to ensure the safety of all persons working in the trench if required. The Contractor is to provide details of these arrangements for approval by the Engineer prior to any work being undertaken in such a trench.
No excavations with battered sides shall be made in roads, footpaths, private gardens, or within 10m of any buildings or other structures.

The Contractor shall erect temporary fencing around all open excavations and post warning signs in English and the local language. All fencing shall be at least 1 m tall, rigid in nature and strong enough to prevent people falling into the trench. The Contractor shall also take all other necessary measures to ensure the safety of the public and others.
The maximum length of excavation which may be left open in any length is 500 m or as directed by Engineer. The opening of two lengths within 500 m of each other shall require the approval of the Engineer.
The excavation shall be kept free of water to allow: placing of bedding, laying of pipes. inspection and testing of joints, coating of joints, placing of backfill and other activities within the pipe trench, to be carried out in a satisfactory manner.
The excavation shall be done such that it does not get far ahead of laying operations. Before excavating trench the alignment of pipeline shall be approved by Engineer. Cuttings length and other appurtenances shall be provided to suit detailed pipe configurations required.
To protect persons from injury and to avoid damage to property, adequate barricades, construction signs. red lanterns and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for the traffic to use the roadways. The relevant Indian standards and the rules and regulations of local authorities in regards to safety provisions shall be observed.
The road metal and also the rubble packing shall first be stripped off for the whole width of the trench/pit and separately deposited in such place or places as may be determined by Contractor and approved by Engineer.
During excavation, large stones and rubble shall be separated and removed from the excavated soil and stacked separately. The material from excavation shall be deposited on either side .of the trench leaving adequate clear distance from the edges of the trench and pit, or as may be necessary to prevent the sides of the trench pit to slip or fall, or at such a distance and in such a manner as to avoid covering fire hydrants. sluice valves, manholes covers etc. and so as to avoid abutting the wall or structure or causing inconvenience to the public and other service organisations or otherwise as Engineer may direct.
Contractor shall take into account additional excavation if any as Engineer may require in order to locate the position of water pipes, drains, sewers etc. or any other works which may be met with, in or about the excavation of trenches while quoting the rates for excavation of trenches while quoting e rates for excavation. Such service lines if met with during excavation shall be properly maintained by Contractor, by means of shoring, strutting, planking over, padding or otherwise as Engineer ma direct, and shall be protected by the Contractor from damage during the progress of the work. Any damage to the service lines shall be borne by Contractor. All precautions shall be taken during excavation and laying operations to guard against possible damage to any existing structure/pipe line of water, gas, sewage etc.

**5.11 Deleted**

**5.12 Laying of pipes and fittings.**

Pipes and fittings shall be laid in accordance with IS 12288 and manufacturers instructions.
The pipeline shall be constructed in lengths with a separate full time gang working on each length. The work on lengths may proceed concurrently. The programme for pipe laying shall be submitted to and be approved by the Engineer at the start of the Contract. Any subsequent changes to the programme shall be submitted to and approved by the Engineer before work to a different programme is started. Excavation for the pipeline in anyone length shall not at any time proceed more than 2 km beyond the end of a hydraulically tested, completed and backfilled length of pipe, unless otherwise approved by the Engineer. The exposed joints between tested sections shall be disregarded in the above definition.
No metal tools or heavy objects shall be permitted to come into contact with the pipes or fittings. External coated pipe shall be handled at all times with wide non-abrasive canvas, rubber or leather straps or other equipment to prevent damage to the coating. The use of chains, wire slings, or any other handling equipment found to be injurious to the coating shall not be permitted. The timber or skids used to support the coated pipe prior to lowering into the trench shall be properly padded with sufficient bags stuffed with sand or straw for the purpose of protecting the coating. Alternatively, the pipe may be supported alongside the trench on mounds of sand. Any injury to the protective coating from any cause must be repaired before the pipes or fittings placed in the trench. During laying operations, no debris, tools cloth or other material shall be placed in the pipe. Pipes and fittings shall be lowered into the trench

with equipment suitable for the weight of the pipes and fittings, and they shall be carefully cleaned before jointing.
Pipes shall be laid accurately to the lines and levels shown on the Drawings, within a tolerance of ± 10mm.
Pipe alignments shall be straight between bends or curves. Length laid to curves shall only be allowed where shown on Drawings or in accordance with detailed proposals approved by the Engineer.
Properly painted sight rails shall be supplied and erected, with boning rods of predetermined measurement for the boning of individual pipes to the correct gradient. The sight rails shall be situated vertically above the line of the pipe or immediately adjacent thereto, and there shall at no time be less than three sight rails in position on each length of pipeline under construction to anyone gradient.
The Contractor may submit to the Engineer for his approval an alternative method of the control of pipe laying to the correct levels and alignment.
The joining of pipes shall be made in accordance with the requirements of this Specification. The Contractor shall obtain from manufacturers all special information regarding the handling of the pipes, joints and other fittings and he will be deemed to have made himself thoroughly conversant with all phases of pipe laying before commencing' the' works.
A "badger" or "bung" about 10mm smaller than the internal diameter of the pipe shall be kept in the pipe at all times, pulled forward as the work progresses. When pipe laying is not in progress, including overnight, the open ends of the pipeline shall be blanked off with a temporary watertight fitting approved by the Engineer. The pipe shall be suitably held down so that the pipe does not become buoyant in the event of the trench becoming flooded.
To restrict the flow of rain runoff along the trench the Contractor shall plug the trench with backfill material at distances not exceeding 250 m until the pipeline can be filled in. The plugs shall be removed when trench filling is taking place. In granular bedding areas the plugs shall be of clay and shall be left in.
All precautions shall be taken during excavation and laying operations to guard against possible damage to any existing structure/pipeline of water, gas , sewage etc. After excavation of trenches, pipes shall not be lowered unless the dimensions of trenches and bedding work for pipes at the bottom of the trenches are approved and measured by Engineer. Pipes and fittings/specials shall be carefully lowered in the trenches. Special arrangements such as cranes, tripods with chain pulley block for lowering the pipes and fittings shall be made by Contractor. In no case pipes and fittings shall be dropped. Slings of canvas or equally non-abrasive material of suitable width or special attachment to fit the ends of pipes and fittings/specials shall be used to lift and lower the coated pipes and fittings/specials. The pipes and fittings/specials shall be inspected for defects and be rung with a light hammer preferably while suspended to detect cracks. If doubt persists, further confirmation shall be done by pouring a little kerosene/dye on the inside of the pipe at the suspected spot. No sign of kerosene/dye should appear on the outside surface. Pipes and fittings damaged during lowering or aligning shall be rejected by Engineer and shall be replaced by new one.

All the pipes are to be laid perfectly true both in alignment and to gradient specified. In case of spigot and socket pipe the socket end of the pipe shall face upstream, except when the pipeline runs uphill in which case the socket ends should face the upgrade. The laying of pipes shall always proceed upgrade of a slope. After placing a pipe in the trench, the spigot end shall be centred in the socket and the pipe forced home and aligned to required gradient. The pipes shall be secured in place with approved backfill material tamped under it except at the socket. Pipes and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipes and fittings/specials of proper dimensions to ensure such uniform space. Precautions shall be taken to prevent dirt from entering the jointing space. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by Engineer. During the period that the plug is on, the Contractor shall take proper precautions against floating of the pipe owing to entry of water into the trench. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or where long radius curves are permitted the deflection allowed at joints shall not exceed 2° for 600 mm and 800 mm, 3° for 300 mm, 350 and 450 mm diameter pipes.

The cutting of pipe for inserting valves, fittings or specials shall be done in a neat and workman like manner by using tools and taking precautions as per manufacturers' recommendations without damage to the pipe so as to leave a smooth end at right angles to the axis of the pipe. For this purpose, pipe: cutting machine shall be used.

The valve chamber frame and cover (Cast Iron and Fibre reinforced concrete) shall be as specified in Part 24. clause 24.3.11.

## 6. MILD STEEL PIPELINE

### 6.1 Scope

This specification covers the general requirements for fabrication, laying, testing and commissioning of longitudinal & circumferential welded mild steel SAW pipes above /below ground, including associated civil works required for the same.

### 6.2 Standards

The following specifications, standards, and codes are part of this specification. All standards, specifications and codes of practice referred herein shall be the latest edition including all applicable official amendments and revisions.

In case of discrepancy between this specification and those referred to herein, this specification shall govern,

| | |
|---|---|
| IS 2062 | Steel for general structural purposes |
| IS 808 | Dimensions for hot rolled steel beam, column channel and angle sections |
| IS 814 | Covered Electrodes for manual metal arc welding for carbon and carbon manganese steel |
| BS 5155 | Specifications for butterfly valves |
| AWSS-5.1 | Specification for mild steel covered arc welding electrodes |
| IS 3613 | Acceptance tests for wire flux combination for submerged arc welding |
| AWS: A-5.17 | Specification for Bare Mild Steel Electrodes and Fluxes for submerged arc welding |
| IS1367 | Technical supply conditions for threaded steel fasteners. |
| IS2016 | Plain washers |
| IS2074 | Ready mixed paint, air dying, red oxide zinc chrome. Priming |
| IS1786 | High yield strength deformed steel bars and wires for concrete reinforcement |
| IS432 (Part-1) | Mild steel & Medium Tensile bars and hard drawn steel wire for concrete reinforcement: Part 1 Mild steel and medium tensile steel bars |
| IS432 (Part 2) | Mild steel and Medium tensile steel bars and hard drawn steel wire for concrete reinforcement: Part 2 Hard drawn steel wire |
| IS 269 | 33 grade ordinary Portland cement |
| IS8112 | Specification for 43 grade Ordinary Portland Cement |
| IS8041 | Specification for Rapid hardening Portland cement |
| IS383 | Specification for coarse and fine aggregate from natural source |
| IS12330 | Specification for Sulphate Resisting Portland cement |
| IS 4353 | Submerged arc welding of mild steel and low alloy steels recommendations |
| IS456 | Code for practice for plain and reinforced concrete |

| | |
|---|---|
| IS800 | Code of practice for general construction in steel |
| IS816 | Code of practice for use of Metal arc Welding for General construction |
| IS817 | Code of practice for Training and Testing of Metal Arc Welders |
| IS1182 | Recommended practice for Radiographic examination of Fusion Welded Butt joints in steel plates |
| IS2595 | Code of Practice for Radiographic Testing |
| IS3658 | Code of practice for Liquid Penetrant Flew Detection |
| IS5334 | Code of practice for Magnetic Particle Flaw Detection of welds |
| ASTM E 94 | Recommended Practice for Radiographic Testing |
| ASTM E 109 | Dry powder Magnetic Particle Inspection |
| ASTM E 138 | Wet magnetic Particle Inspection |
| ASTM E 165 | Liquid Penetrant Inspection |
| IS 3600 | Methods of testing of Fusion Welded joints and Weld metal in steel |
| IS 483 | Recommended practice for Radiographic inspection of fusion welded butt joints in steel pipes |
| IS 3589 | Specification for seamless or Electrically welded pipes for water, Gas and Sewage |
| IS 6631 | Steel pipes for Hydraulic purposes |
| IS 7343 | Code of practice for ultrasonic testing for ferrous Welded Pipes and Tubular Products |
| IS 2598 | Safety code for Industrial Radiographic Practice |
| IS 5822 | Code of Practice for laying of electrically welded steel pipes for water supply |
| IS 1566 | Hard drawn steel wire fabric for concrete reinforcement |
| IS 6419 | Welding rods and bare electrodes for glass shielded are welding of structural steel |
| IS 1974 | Bare wire electrodes for submerged arc welding |
| IS 7307 | Approval tests for welding procedures |
| IS 7310 | Approval tests for welders working to approved welding procedures |
| IS 2720 | Methods of test for soils |
| IS 780 | Specification for Sluice valves for water work purposes. (50 to 300mm size) |
| IS 2906 | Specification for sluice valves for water work purposes (350 to 1200mm size) |
| IS 1916 | Steel cylinder pipe with concrete lining and coating |
| IS 7322 | Specials for steel cylinder reinforced concrete pipes |
| IS 11906 | Recommended for cement mortar lining for cast iron, mild steel and ductile iron pipes and fittings for transportation of water. |

### 6.3 Materials

Steel plates – The steel plates for pipes fittings, specials and stiffeners shall be of mild steel conforming to IS2062 Grade B, with no negative tolerances on the plate thickness

Cement – Ordinary Portland cement conforming to IS 269.

Aggregate – The aggregate shall confirm to IS 383
Water – The water used in preparation of concrete mix shall conform to the requirements of mixing water specified in IS : 456
Welding consumables – such as electrodes, filler rods and wires shall conform to IS 814, IS 3613, IS 6419 and IS 7280
When requested by the Engineers, the contractor shall provide test sample of the materials to be used in the works for testing. The cost of such tests shall be borne by the contractor and shall be included in his item rates.

**6.4 Inspection**

All works and material under specification will be rigidly inspected during all phases of manufacture and testing and such inspection shall not relieve the contractor of his responsibility to furnish materials and performed work in accordance with this specification.

The contractor will notify the engineer, in advance of the procurement of materials and fabrication thereof, in order that the employer may arrange for mill and shop inspection. The engineer may reject any or all materials or work that does not meet with any of the requirements of this specification. The contractor shall rectify or replace such rejected material/performed work at his own cost, to the satisfaction of the engineer.

The Engineer shall have free access to those parts of all plants or any other premises and sites that are concerned with the furnishing of materials or the performance of the work under this specification.

The contractor shall supply free of cost required specimen of materials for testing by the employer at any time during the progress of work and shall bear the cost of all such tests or retests to the satisfaction of engineer.

The contractor shall provide 2(two) sets of accurate “GO” and ‘No Go’ ring gauges to measure the diameter of pipes, specials and fitting for the use of the Engineer at no extra cost.

**6.5 Manufactures of Pipes and Specials**

**6.5.1 General**

The pipes shall be truly cylindrical, and straight in axis. The ends shall be accurately cut and prepared for field welding the external circumference of the pipe pieces which are to be fixed adjacent to the flange adapter with fixed outer diameter shall not deviate from theoretical one by more than 2mm. to obtain this accuracy the pipe shall be rolled several times, if necessary, as pipe pieces should be truly cylindrical. The external longitudinal welding of this pipe shall be ground smooth flush with surface to the satisfaction of the Engineer, for a length of 200 mm from the ends of the pipe. No extra cost shall be charged by the contractor for this grinding work.

Minor repair by welding or otherwise shall be permitted at the discretion of the engineer, but such repairs shall be done only after obtaining the prior permission from the Engineer. Any pipe or part thereof, which develops injurious defects during welding or other operations, shall be rejected.

**6.5.2 Fabrication Yard**

This fabrication yard meant for fabrication of pipes, specials etc shall also be equipped with facilities for testing, painting, lining, etc. For completing the work under the present contract within the contract period, the fabrication yard shall be equipped with adequate numbers of equipment and plant including:

- Plate bending machine for rolling of pipe drums
- Automatic welding machines (suitable for circumferential as well as longitudinal welding)
- Hydraulic welding machines
- Traveling gantry or crane of capacity 10 tonnes or above
- Mobile cranes for loading/unloading of plates, pipes etc. 15 tonnes capacity each
- Lathe for machining of the flange rings, plates etc.
- Equipment for sand blasting, cement mortar lining, and facilities for bitumen wrapping

The fabrication yard shall have adequate area, and shall also have stacking areas for the stacking of plates, pipes and fittings. The contractor shall make his own arrangements for any area required.

### 6.5.3 Demonstration

Contractor shall demonstrate the works in this contract at fabrication yard before commencement of works and during the works at intervals specified and as directed by the Engineer. No payment shall be made in this regard.

The works under demonstration shall include but not limited to the following:

- Manufacture of pipe and specials
- Machine and manual welding to qualify 'Welding Procedures'
- Hydraulic testing
- Pipe handling procedures

### 6.5.4 Cutting plates to size

The plate provided shall be utilized so as to minimize wastage and so as to make the pipe as far as possible with one longitudinal joint. Plate sizes shall generally suitable for fabrication of 1.5 m long shells (minimum), to be made up to pipes of 6.0 m to 12 m lengths to suit contractor's proposed working methods.

Before cutting, all the edges of the plates shall be cleaned by brushing/grinding both the sides.

After the plates are cut, the edges shall be made smooth and even by polishing with an electrical or pneumatic grinder to remove all inequalities. Care shall be taken to see that the cut edges of the plate are perfectly straight. Jigs to be used for this purpose shall depend upon the types of cutting machine used. The plates cut to the required shapes shall be checked for the correctness before they are rolled into pipe drums. If any correction is required, the contractor shall do the same by re-cutting, if necessary. If any plate or flat is found to be warped, to have corrugations, the defects shall be removed by putting the plate or flat into a roller press and rectified. Laminated or heavily corroded plate shall not be used in manufacturing of the pipe.

The ends of the finished pipe in the factory shall necessarily have bevel ends conforming to IS 3589 to facilitate field welded joints.

### 6.5.5 Rolling of Plates

The plates cut to the exact size shall be put into a rolling machine to form a pipe of the required diameter. The contractor shall adjust the rolling machine so as to give a uniform curvature to the pipe throughout its circumference. The curvature obtained shall be checked by the contractor's foremen during the process of rolling and if proper curvature is not obtained at any place including the ends, the rolling operation shall be repeated at this stage or even after the longitudinal welding of the drum where directed. Heating of plates to obtain the desired curvatures shall not be permitted.

### 6.5.6 Tracking the Drums

The rolled drums shall be kept on an assembly platform for tracking, care being taken to ensure that the tacked drums have either faces at right angles to the axis of the pipe. A gap of 2 mm to 4 mm shall be maintained while tacking the drum, where the manual arc welding, is permitted. However, where the welding is to be done by automatic welding machine, there is no need to maintain such gap. To achieve this objective, clamp spiders, tightening rings and or any other approved gadgets shall be used. Each drum, before being taken to the assembly platform, shall be numbered on the inside with oil paint, stating the plate thickness as well.

### 6.5.7 Assembly of Drums into Pipes

The tacked drums shall then be transported to an assembly platform where they shall be welded together to form suitable pipe-lengths. Plate shall be bent in the maximum possible width to reduce the number of circumferential joints. The number of longitudinal joints shall be as per IS 3589.

The longitudinal joints shall be staggered at 90 degrees. The drums shall be tacked together as above. The assembly shall be truly cylindrical and without any kinks. The faces shall be at right angles to the axis of the cylinder. A suitable arrangement for testing the correctness of the pipe shall be provided by the contractor at the assembly platform.

### 6.5.8 Specials

Specials shall be fabricated to the dimensions shown on drawings. Specials, such as tees, Y-pieces, bends, tapers, etc. shall necessarily be in steel and shall be in accordance with IS 7322/BS 534/AWWA C208 and ASME standards and tested and laid in the same manner as the pipes.

Standard fittings shall be used wherever possible in preference to fabricated fittings. Standard fittings shall be manufactured in accordance with standards above. Where fabricated fittings are supplied with approval of Engineers they shall be fully workshop fabricated and tested in accordance with above standards.

Tee and branches on steel pipelines must be reinforced by welding collars around the base of the branch and in the case of large diameter branches, increasing the main pipe wall thickness or making use of crotch plates. Unless shown otherwise on the drawings branches shall comply with the requirement of the following table:

| Fitting Description Pipe work O.D. (mm) | Main Pipe wall Thickness (mm) | Branch Pipe Wall Thickness (mm) | Collar Details (mm) |
|---|---|---|---|
| 324 off 1320 | 10 | 5.0 | 150 Wide x 14 to 25 Thick |
| 324 off 1320<br>324 off 1999-Level Invert Tee | 14/12 | 5.0 | 150 Wide x 14 to 25 Thick |
| 324 off 1647 | 14/12 | 5.0 | 150 Wide x 14 to 25 Thick |
| 324 off 1241 | 11/12 | 5.0 | 150 Wide x 14 to 25 Thick |
| | 8/10 | 5.0 | 150 Wide x 14 to 25 Thick |

The fittings shall be designed and, if considered necessary by the Engineer, fabricated by a specialist contractor and the design calculations and drawings shall be submitted to the Engineer for approval. For oval shaped collars the width given in the above table shall be at the narrowest point. All other fittings, tees, branches, crosses and bends are to be designed by the fabricator.

Steel specials shall have the same chemical and mechanical properties and shall be compatible in all respects with the pipes with which they are to be used. The marking of pipes and fittings shall be as specified.

### 6.5.9 Electrodes

The contractors shall use appropriate type and size of electrodes with suitable flux covering depending on the thickness of plate and the type of joint. They shall also use standard current and voltage required for the machine in use as per manufacturers directions. Welding electrodes shall conform to IS 814 and IS 4353. Electrodes from reputed manufacturers like Advani Oerlikon, D& H, Philips etc. shall be used with the approval of Engineer. India made or equivalent foreign made electrodes of the approved quality shall be used. The contractor shall provide suitable equipment and ovens to keep the electrodes dry at the desired baking temperature.

### 6.5.10 Welding

Upon receipt of the order and prior to the start of fabrication, the contractor shall submit to the Engineer for his approval the 'Welding Procedure Method Statement' he intends to use in the shop work. At the same time the procedure for the field welding must be submitted to the Engineer for his approval.

All components of pipe shell, either straight or bent etc shall be welded by use of automatic arc welding machine by submerged arc process with alternating current. The strength of the

joint shall be at least equal to that of the parent material. Manual welding shall be adopted only when machine welding is not possible.

The contractor shall use electrodes of approved make and size, the size depending on the thickness of the plate and the type of joint. Standard current and arc voltage required for the machine shall be used with necessary modifications as may be found necessary after experimental welding. For this purpose, samples of welded joints shall be prepared and tested in the presence of the Engineer for qualifying the welded procedure Method statement. Only approved welding procedures of the Engineer shall be obtained.

All the shop and the field welding conform to IS 4353, IS 9595, IS 816.

All longitudinal and circumferential joints shall be Single-V or Double-V butt joints with or without backing plates. After completing the welding joints of pipes or plates from one side, and before the welding on the other side, the joints shall be back chipped/ gouged and ground to remove irregular penetration till the even surface is exposed. Gouging shall be restored to when the plate thickness is above 6mm.

All circumference welds involving plates of unequal thickness shall be so kept that the inside surface of plates match to provide stream lined joints without alteration in the internal diameter.

The welding shall be the best workmanship free from weld defects. In order to maintain a good standard in welding, welders shall be tested by the contractor before they are entrusted with the job. Qualification standard for welding procedures, welders and welding operators shall confirm IS 7307 and IS : 7310 (latest). Only those who pass the test shall be allowed to work on the job. Periodical tests as regards their competence shall also be taken at suitable intervals and those found incompetent shall be removed from the job. If an incomplete welder has already welded some pipes, all welding done by him previously shall be fully checked by X-ray in addition to the regular X-ray inspections. The defects if any, shall be rectified to the satisfaction of the Engineer. All such check tests and rectification of defects shall be entirely at the cost of the contractor. No pipes or steel sections shall be erected unless the work of the welders concerned has been proved to be satisfactory and qualified. Site welds shall be done by welders qualified for the various welding positions as per applicable IS codes and standards.

A record shall be maintained showing the names of welders and operators who have worked in each individual joint. Manual arc welding shall preferably be carried out by a pair of welders so that by, observing proper sequence, distortion can be avoided. A joint entrusted to a particular individual or a pair shall be as far as possible, completed by them in all respects, including sealing run. No helper or other unauthorized person shall be permitted to do any welding whatsoever.

The weldment should not become brittle or sensitive to blows and there should be no loss of toughness due to welding or heat treatment. The material after welding and heat treatment shall match with the base metal properties including original ductility. The weld should in no point be less than the nominal thickness of plate a slight reinforcement as per IS code shall be maintained on all weld joints. Final welding of closure gaps should be carried out within a temperature range of average air temperature ± $8^{o}$ C.

Where required by the Contractors working methods the pipes shall have cable holes /entries installed in the fabrication shop; they shall comprise a hole in the pipe with a reinforcing plate welded to the pipe with a tapped hole in it large enough to allow the passage of the cables and other paraphernalia necessary for welding the pipes. A screwed plug shall be provided to close the hole.

### 6.5.11 Testing of Weld Coupons

Test pieces shall be provided by the contractors for both longitudinal and circumferential welded and joins at the positions pointed out by the Engineer the sample so taken out shall then be cut to the exact shape and dimensions and machined as described in relevant standards before testing for chemicals and mechanical properties.

The entire cost of the tests including provision of test samples, machining the test pieces, transport to and from the laboratory and testing them in a laboratory, payment of all testing

fees, cleaning and painting etc. shall be borne by the contractors. The tests shall be carried out in a government or semi government institute approved by the Engineer. This shall be arranged by the contractor with the approval of Engineer. the testing laboratory shall have instruments/ equipments which are having calibration requirements traceable to National or International standards.

The following tests shall be carried out:

Mechanical Tests

The test plates shall be subjected to all mechanical tests as per the approved method statement, or as otherwise reasonably directed by the Engineer. Test shall be carried out in the accordance with relevant standards. The tests shall include determination of yield strength, tensile strength, elongation and bend tests. Tensile test shall be carried out in accordance with IS 1894. One test plate shall be provided for from each lot of 100 lengths.

If a test specimen shows defective machining or develops flaws not associated with welding, it may be discarded and another specimen submitted. The welded joint shall exhibit mechanical properties not lower than those specified for highest 2062 Grade B.

Guided bend test shall be in accordance with IS 3589/IS 3600. One bend test shall be carried out from each lot of 50 lengths. The test shall comply with the requirements specified in IS 3589/ IS 3600.

Field Joints

The field welded joints shall be tested in accordance with the proce3dure laid down in IS3600. One test plate shall be taken for every 10 joints and shall be subjected to mechanical and chemical tests as specified above.

**6.5.12 Re-tests**

If the results of tests of any lot do not conform to the requirements specified, retests of two additional specimens from the same lot shall be made,. Each of which conform to the required specifications, in case of failure of one or both, gouging and repairing shall be carried out to the particular lot of joints from which the samples have been taken as directed by Engineer before the lot can be accepted. The rectification process shall also have adequate tests plates and they shall be tested for complaints with the IS codes/standards.

In case both the samples yield satisfactory results in the retest described above, gouging and repairing will be required to the carried out on the joint which has failed in the initial test only.

All charges in connection with retesting of the welded sample including machine, testing etc. shall be borne by the contractor.

**6.5.13 Radiograph of Welded Joints**

As soon as practicable, after welding is done, every longitudinal and circumferential welded length minimum 10% (ten percent) length of the weld at random for each pipe shall be radio graphed, to detect welding defects as per the requirement of IS4853 and as directed by Engineers. This 10% sampling will be at random but ensured 100% coverage of junctions of longitudinal and circumferential joints. If the results of such radiography fail to conform to the requirements, the contractor shall carry out 100% radiography test for the pipe as directed at the contractors cost to the satisfaction of the Engineer.

The weld repels or welds surface irregularities and slag etc., on both inside and outside shall be removed by any suitable mechanical process to a degree such that result in radiographic contact due to any remaining irregularities cannot mark or be confused with that of objectionable defect. The radiograph shall be made in strict accordance with the latest requirements and as per the latest and most efficient technique either with X-Ray or gamma ray equipment. The safety requirement during radiography shall be in accordance with IS 2598.

The radiographs are to be marked in such a way that the corresponding portion of the welded seam and the welder can be readily identified. All radiographs will be reviewed by the

Engineers to identify the defects and determine those, which requires rectification. Defects that are not acceptable shall be removed by chipping; grinding or flame gouging to sound metal and resulting cavities shall be welded. After rectification, the joint is to be radio graphed again to prove the quality of the repair. The radiograph will be judged as acceptable or un acceptable by the Engineer based on the latest standards prescribed by the relevant Indian standard specification.

All X-rays shall be taken with equipment and by personal of the Contractor. Films shall be developed within 24 hours of exposure and be ready in accessible at all times for inspection by the Engineer. the contractor shall provide for the use of the Engineer suitable X-Ray viewing equipment. X-Ray films shall be properly maintained by the contractor. A complete set of radio graphs and records as described in IS : 2595, for each job shall be retained by the contractor and shall be handed over to the BWSSB on completion of the Contract. All films shall be identified by the number and chart prepared indicating location of any work associated with the pipe erection and such inspection shall be performed by the radiographer at the discretion of the Engineer.

Radio graphic inspection of welded joints:

All welded joints to be radio graphed shall be examined in accordance with

| | | |
|---|---|---|
| IS 2595 | - | Code of practice for Radiographic Testing |
| IS4853 | - | Recommended Practice for Radiographic examination of fusion welded Butt-joints in steel pipe |
| IS1182 | - | Recommended Practice for Radiographic examination of fusion welded Butt-joints in steel pipe |
| IS2598 | - | Safety Code for Industrial Radiographic Practice |

Radiographer performing radiographs shall be qualified in accordance with SNT-TC-1A . Supplement and appendices “Recommended Practice for Non-destructive Testing Personal Qualification and Certification” published by the American Society for Non-Destructive testing as applicable for technique and methods used.

Final acceptance of Radiographs shall be based on the ability to see the prescribed pentameter image and the specified hole.

Sections of welds that are shown by Radiography to have any of the following types of imperfections shall be judged unacceptable and shall be repaired.

- Any type of crack, or zone of incomplete fusion or penetration
- Any elongated slag inclusion which has length greater than 6 mm
- Any group of slag inclusion in line that have an aggregate length greater than thickness in a length of 12 times thickness, except when the distance between the successive imperfection exceeds 6 L where L is the length of the longest imperfection in the group.
- Rounded indication in excess of that specified by the acceptance standards given earlier.

### 6.5.14 Tolerances

Tolerances of the plate thickness shall be ± 3%. Minimum width of the plate shall be 1.5m.

A tolerance for straight pipes shall be in accordance with IS 3589 or as amended below.

Finished pipe sections shall be truly straight with walls parallel to the axis of the pipe and shall not be out of the alignment by more than 0.2% of the total length.

The outside circumference of the pipe shall not vary by more than 0.5 per cent.

Outside diameter of the pipe shall not vary by more than plus or minus 0.5 per cent.

The permissible tolerance for specials for diameter, arm length and angular deviation shall be in accordance with IS 7322/BS 534.

Whenever any dent, i.e., a significant alteration of the curvature of the pipe shell is noticed, the depth of the dent shall be measured between the lowest point of the dent and the pipe shell curvature line. All dents exceeding 2 per cent of the outer diameter of the pipe shall be removed by cutting out a cylindrical portion of the pipe and replacing the same by an

undamaged piece of the pipe. the Engineer may permit insert patching if the diameter of the patch is less than 25 percent of the nominal diameter of the pipe. Repairs by hammering with or without heating shall not be permitted. Any damage to the coating shall also be carefully examined and rectified.

### 6.5.15 Pipe Testing in Fabrication Yard

A hydraulic test shall be carried out at the fabrication shop for each pipe length fabricated, in the presence of and to the satisfaction of the Engineer. All pipes and specials shall be subjected to hydraulic test at the fabrication yard after fabrication, but before application of protective coatings.

Prior to testing, the pipe shall be inspected thoroughly and all the apparent defects in welding such as slag, prosperity etc. shall be repaired by gouging and re-welding.

Each pipe shall be filled with water slowly and the pressure increased uniformly until the required test pressure is reached. The test pressure shall be 18 bars for pipes and specials with 10mm thick MS plate.

The pipe tested shall be given a serial number which shall be painted with details such as pipe number, shell thickness, diameter, length etc. as directed by Engineer. It shall be entered in the register to be maintained by the contractor. The register shall be maintained in suitable format giving the following information for each shell tested:

- Serial No.
- Pipe No.
- Date of test
- Specification and thickness of steel
- Weight of pipe shell tested
- Maximum test pressure
- Details of test performance
- Details of radiographic examination of welds
- Name of Engineer’s representative witnessing tests.
- A copy of these details shall be furnished to the Engineer.

For indicating the pressure inside the pipe an accurate pressure gauge of approved make duly tested and calibrated for the accuracy of readings shall be mounted on one of the closures which close the pipe ends.

The pressure shall be applied gradually by approved means and shall be maintained foe at least 10 minutes or till the inspection of all welded joints is done during which time the pipe shall be hammered throughout its length with sharp blows, by means of a 1 kg hand hammer.

The pipe shall withstand the test without showing any sign of weakness, leakage, oozing or sweating. If any leakage or sweating is observed in the welded joints, the same shall be repaired by gouging and re-welding after dewatering the pipe. The repaired shall be re-tested to conform to the specified pressure.

If any leak or sweating is observed in pipe shell the pipe under test shall be rejected temporarily. The Contractor shall stack such rejected pipes separately in his yard. The Engineer shall inspect the same as shall determine the nature of repairs to be carried thereon and shall then decide as to how and where they shall be used. No payment shall be made of handling or carrying out repairs, but, payment for, fabrication and shop hydraulic testing of the pipe shall be released only after acceptance of the pipe with necessary repairs and subsequent testing etc. are carried out by the Contractor to the satisfaction of the Engineer. The Engineer shall be supplied with two copies of the results of all the tests carried out.

No pipe shall be transported out of the fabrication yard to the site unless they have hydraulically tested except permitted by the Engineer in writing to do so.

### 6.5.16 Marking

All pipes and specials shall bear the following markings. The marking shall be on the side which will be the inside of the pipe after bending. The marking operation shall be conducted with full size rulers and templates. Only blunt nose punches should be used.

The plates used for fabrication of pipes shall be laid out in such a way that when the shells are completed one set of original identification markings for the material will be plainly visible. In case these markings are unavoidably cut out, they shall be accurately transferred by the contractor to a location where these markings will be visible on the completed work.

After the hydraulic tests on the specials the direction of the flow shall be stamped in a prominent manner.

- Outside Diameter (mm)
- Length of pipe/angle of the bend (m/degrees)
- Plate thickness (mm)
- Approximate of weight of the pipe/special (tons)

**6.6 Joints**

**(i) General**

Unless detailed otherwise, all pipes and fittings shall have welded joints as detailed in Drawings. Where shown on the Drawings, flanged joints or collar sleeve joints shall be provided.

**(ii) Welded Joints**

The use of butt welded joints for joining pipes shall be in accordance with clause 6.6.10 and end preparation shall be in accordance with IS 3589

**(iii) Sleeve collar joints**

The use of sleeve collars shall generally be limited to the jointing of pipes at tie-ins. The thickness of the external steel sleeve collar shall be not less than that of the pipe itself and the length a minimum of 300 mm. the sleeve shall be joined to the pipe with an internal full depth structural weld and external sealing welds to allow the joint to be gas tested. A gas testing hole shall be made at each end of the sleeve and for the purpose of gas testing joints.

**(iv) Flanged Joints**

Flanged shall comply with IS 7322/BS4504. The nominal pressure rating shall be at least equal to the highest pressure rating of the pipes of fittings to which they are attached, but with a minimum PN 16. The contractor shall fabricate flanges meeting the requirements of the pipe sizes under this contract or otherwise to suit the abutting valves or other connections, if they are not readily available. Flanges shall be provided with all necessary nuts, bolts, washers and gaskets, as specified herein. The Contractor shall also supply in suitable containers sufficient graphite grease for application to the bolt threads when joints are made.

**(v) Slip of Type Couplings**

Slip on Type Couplings shall include the following coupling:

- Straight flexible couplings
- Stepped flexible couplings
- Flange adopters
- Dismantling joints

Slip on Type Couplings shall be from the Viking Johnson System manufactured by the Victaulic Company or form approved suppliers whose fittings meet the same Specifications.

The preparation of pipe ends for slip-on Type Couplings shall be in accordance with the requirements of and the tolerances specified by the joint manufacturer. Couplings shall be installed fully in accordance with the manufacturer's recommendations.

Slip on Type Couplings shall be protected if buried with Dens mastic and Dens tape wrapping or similar approved material applied in accordance with the manufacturers recommendations. Flexible joints shall be harnessed or tied where shown on the Drawings. Flexible couplings and flange adaptors shall be supplied with transit protection.

### 6.7 Storage

Pipes and fittings shall be stored raised off the ground and shall be carefully supported, cushioned and wedged. Special care shall be taken to ensure the steel pipe is cradle and supported in a manner that prevents any distortion of the pipes.

All gaskets, nuts and bolts flange adaptors and other similar items shall be stored in the dry conditions, raised off the ground in sheds or covered areas.

Where items required special storage requirements, the method of storage shall be to the approval of Engineer and in accordance with manufactures requirements.

Storage areas shall be set out to facilitate unloading, loading and checking off materials.

All pipe materials shall be inspected when deposited in the storage area any defects or damage shall be noted and reported to the Engineer. the pipe material shall only be repaired or replace with the Engineers approval.

End covers and other protection shall not be removed until incorporation of the pipes or fitting into the works.

### 6.8 Transportation and Handling

All pipes and specials fabricated in the yard and temporarily stacked in the factory shall be transported carefully to the site of laying after internal cleaning.

Any vehicles on which pipes are transported shall have a body of such length that the pipes do not overhang. Last pipes shall be placed on cradles and the loads properly secured during transit.

Additional precautions shall be taken to avoid deformation of flexible pipes. To maintain their circular cross-section internal struts shall be fitted in the pipes. Details of the proposed strutting system shall be submitted to the Engineer to the approval and if required by the Engineer, the method of strutting shall be demonstrated and tested on site.

The pipes and specials shall be handled in such a manner as not to distort their circularity or cause any damage to their coating. Wide non-abrasive or other approved slings shall be used and all hooks and other metal devices shall be well padded. Hooks engaged on the corner wall surface at pipe ends shall not be used. Steadying ropes shall be employed.

The positions of lifting slings shall ensure that stresses and tendency towards deformation in the pipes are kept to a minimum.

Pipe handling equipment shall be maintained in good condition and any equipment, which is in the opinion of the Engineer, may cause damage to the pipes shall be discarded.

Under no circumstances shall pipes be dropped, be allowed to strike one another, be rolled freely or dragged along the ground.

No valves shall be lifted by the spindle.

Fabricated materials such as man-hole covers, appurtenances, bolts, nuts, flanges, saddles, collars, bypass arrangements etc., shall be transported to the site of laying from the fabrication yard according to needs of the laying operations only.

### 6.9 Pipeline Construction

#### 6.9.1 General

Laying/Erection of fabricated pipe lengths shall be carried out by the Contractor who shall equip himself, at his cost with all necessary tools, machinery, labour etc., required for the purpose. The pipeline shall be constructed in lengths with a separate full time gang working on each length.
Except for routine welding of joints, no other work shall be done in the absence of Engineer.

The components of the sections of the pipeline such as plates, and pedestals have been so designed that the centers of the plates and pedestals shall coincide at the mean temperature of the locality. For this reason, all works such as fixing flanges, plates etc. in true alignment, and in correct position and tack welding pipes shall be done at the mean temperature. For

ascertaining the temperature, the contractor shall provide mercury cups and fix them to the pipe shell from outside and shall also provide thermometers of the required type and range. No extra payment shall be made for this.

### 6.9.2 Laying Programme

The contractor shall submit a detailed bar chart for manufacturing and laying of the pipeline, which shall be subject to the Engineer's approval. In preparing this bar chart, the contractor shall plan his activities such that the laying of pipes shall closely follow the manufacturing schedule and no pipes shall remain in factory or at site for a period more than two months.

Together with the chart he shall submit a methodology describing how he will carry out this work within the contractual period and the required resources in terms of construction equipment and other facilities that he shall utilize to complete the works.

### 6.9.3 Contractor to Resurvey the Pipeline Route

While setting up the site the contractor shall undertake survey of the pipeline route and compare this with the survey supplied at the time of tender and a joint record. Levels are to be taken at 30 m intervals and at any sharp changes in level. Where practical the chainage points shall coincide with those original surveys. Not less than 14 days before commencement of pipe laying the Contractor shall supply the Engineer, any discrepancies, if observed, with two hard copies and one computer disk copy of the survey.

The format of the survey shall be identical to the longitudinal sections which formed part of the tender documents. The Engineer shall supply the contractor a copy of the longitudinal section and the contractor is to use this to produce new drawing. Details of all the benchmarks which were used in the original survey of that length of pipeline shall be supplied to the contractor by the Engineer.

The Engineer shall resolve any problem arising from discrepancies between the two surveys and supply the contractor with any revised Drawings that may be required.

## 6.10 External Coating with Corrosion resistant tapes

Unless otherwise specified or stated on the drawings the pipeline to be laid underground and the exposed pipeline supported on saddles shall be coated with the corrosion resistant tapes confirming to IS: 10221-1982 Appendix B.

### 6.10.1 Material

**(i) Primer:** Primer shall be a coal tar / asphalt or suitable resin product. It shall be a liquid that can be applied without heating and shall produce an effective bond between the surface to be protected and the subsequent coating of coal tar / asphalt tape. Primer shall contain no benzol and shall not settle in the container to form a cake that cannot be mixed easily by hand stirring. Primer shall have good sparing and / or brushing properties and a minimum tendency to produce bubble during application.

**(ii) Tapes:** Tapes shall be comprised of coal tar / asphalt component supported on fabric of organic or inorganic fibers. The coal tar / asphalt component shall comply with quality provisions as in 4.1.2 & table 13 of IS: 10221-1982. The fabric shall be thoroughly coated and completely covered on both sides with coal tar / asphalt component. Tape shall be furnished in standard width as recommended by the manufacturer. Rolls shall be warmed on hallow course having a minimum inside diameter of 37mm. Tape shall have sufficient pliability at a temperature of $25^{o}$ to unwind from the roll without disbanding the coal tar / asphalt component from the fabric.

- Length: the standard length of tape on one roll shall be 9, 15 or 23m
- Thickness: the variation in the thickness of the tape shall not exceed ± 0.125mm from the thickness specified. In no case shall thickness of the tape be less than 4.00mm.
- General requirement: when heated to a condition permitting conformation to the surface to be coated, the tape shall withstand, without tearing, the tensile force necessary to obtain a tightly wrapped coating free of voids. The tape shall provide a minimum thickness of 15 mils of coating between the steel surface and the inner face of

the fabric when applied under tension necessary to provide a void free warp. Should the tape have plastic film separator of the type that is not removed prior to application, the thickness of the separator shall not adversely affect the bond between overlapped sections of tape.

### 6.10.2 Application of Wrapping tapes:

**(i) Cleaning:** Pipe surfaces shall be thoroughly cleaned and dried before the primer is applied, and shall be free of dirt, grease, oil rust, scale or other foreign matter. The pipe shall be cleaned by any one of the following mutually agreed methods.

- Grit / shot blasting
- Sand blasting &
- Mechanical cleaning.

Primer shall be applied by brush, glove or spray so as to give a coating thickness i.e., between two & four mills when wet. The primer shall be allowed to dry to the touch prior to tape application. Primer & tape shall be furnished by the same manufacturer.

If the application is done in cold weather, the surface of the pipe shall be pre-heated until it is warm to the touch and until traces of moisture are removed, and than the primer shall be applied allowed to dry.

### 6.10.3 Field Application of Tape:

The tape shall be wrapped in accordance with the manufacturer's recommendations in a manner that shall meet the adhesion and holiday detection requirements of IS: 10221-1982. In any event, there shall be a minimum of 12mm overlap per single wrap. Earlier single or double wraps shall be specified by the purchaser. In application, care shall be taken that there are no air pockets or bubbles beneath the tape and shall be in intimate contact with the primed steel surface. The manufacturer shall provide assistance in demonstrating the proper method of application if requested by the contractor.

### 6.10.4 Field Adhesion Test:

Adhesion tests shall be made to determine the proper bond between the coal tar/ asphalt component of the tape and the properly primed pipe. The number of adhesive tests required to determine quality of application is at the inspector's option, but, desirably, no more than one test per special section, connection, or fittings should be performed to avoid extensive repair unless defects are found in the first test.

The temperature of the tape and pipe to be tested shall be between $10^{o}$C and $27^{o}$. If the temperature is outside this range, hot or cold water shall be poured over the test area until this temperature range is attained. A test area shall be selected by the inspector where the tape is smooth for 15cms in the longitudinal direction of the tape. Two knife cuts that are 15cm long and 5cms apart shall be made through the tape. A flat blade shall be used to pry up 5cm of the fabric. This 5cm flap of fabric shall be grasped firmly in one hand and shall be pulled a quick motion in the direction of the remaining 10 cm of the 15cm knife cut.

The adhesive is satisfactory if the tape tears at the point of stripping or the or the fabric strips from the under laying coal tar component, leaving exposed not more than 10 percent of the primer or metal.

## 6.11 Buried Pipelines

### 6.11.1 Trenching

Trenching includes all excavation which is carried out either by hand or by machine and shall be carried out in accordance with all general requirements of Part-5. In addition to those general requirements, the following requirements shall apply to pipelines:

The width of the trench shall be kept to a minimum consistent with the working space required and having regard to the safety of the trench, the method of laying and jointing the pipe and the need to avoid damage to pipe coating and so as to provide the minimum horizontal clearance as stated in the table below. The bottom of the trench shall be properly trimmed to permit even bedding of the pipeline.

The portion of the trench which extends from the formation level to not less than 300 mm above the crown of the when laid in its correct position, shall unless otherwise specified or ordered by the Engineer, be formed with vertical sides. The clearance between the sides and the bottom of the trench and the barrel of the pipe shall not exceed the following, inclusive of any allowances required for temporary trench supports:

| Pipe Nominal Bore (mm) | Bottom Clearance (mm) | Site Clearance (mm) |
|---|---|---|
| 600 to 1000 | 250 | 400 |
| 1050 to 2500 | 300 | 500 |

The clearance at joints may be increased to allow the joints to be made and inspected, any proposed increased shall be approved by the Engineer.

All trenches deeper than 1.2m shall have the trench walls battered or supported to ensure the safety of all persons working in the trench of required. The contractor is to provide details of these arrangements for approval by the Engineer prior to any work being undertaken in such a trench.

No excavations with battered sites shall be made in roads, footpaths, private gardens, or within 10m of any buildings or other structures.

The contractor shall erect temporary fencing around all open excavations and post warning science in English and the local languages. All fencing shall be at least 1 m tall, rigid in nature and strong enough to prevent people falling into the trench. The contractor shall also take all other necessary measures to ensure the safety of the public and others.

The maximum length of excavation which may be left open in any length is 500 m. the opening of two lengths within 500 m of each other shall require the approval of the Engineer.

The excavation shall be kept free of water to allow: placing of bedding, laying of pipes, welding of pipes, inspection and testing of joints, coating of joints, placing of backfill and other activities within the pipe trench, to be carried out in a satisfactory manner.

### 6.11.2 Bedding

The depth and type of bedding shall be as shown in the Drawings or as directed by the Engineer. Where rock or boulders are encountered, the trench shall be transmitted to a depth of at least 300 mm below the level at which the bottom of the barrel of the pipe is to be laid and filled to a like depth with sand as shown on the Drawings or as directed by the Engineer.

The class of bed and surround to be used are indicated below:

| Class of bed and surround | Brief description of bedding material |
|---|---|
| Class N<br>Class S | Well Graded Sand<br>Granular material |

Class S bed and surround shall be used on all pipes unless otherwise specified or shown on the Drawings.

Class N bed material shall only be used where the pipe trench is founded in hard rock or otherwise directed by the Engineer. the sand shall be clean and well graded and free from topsoil, clay or vegetable matter and to the approval of the Engineer. if the sand supplied is unclean it shall be washed. In no case shall sand containing more than 3.5% by dry volume or 5% by wet volume of clay, loam or silt be accepted. Tests specified for determining silt in sand and organic impurities as described in IS 383 shall apply.

The graded granular bed material for use in Class S bedding and surround shall consist of durable gravel, crushed stone or disintegrated rock. Selected material excavated from the pipe trench may be used, provided it contains no topsoil, clay or vegetable matter and is to the approval of the Engineer and shall be supplied with the certification which gives details of its content of the granular material shall not exceed 0.5% and 0.06% by weight respectively.

**Graded Material**.

The Contractor's method of grading the excavated material shall be to the approval of the Engineer. All Class S graded material shall pass through test sieves to IS 460 (Part 1) in the following proportions by mass :

| Aperture Size | Percentage passing |
|---|---|
| 50 mm | 100% |
| 37.5 mm | 90 - 100% |
| 20.0 mm | 35 – 70% |
| 14.0 mm | 25 – 55% |
| 10.0 mm | 10 – 40% |
| 5.0 mm | 0 - 5% |

### 6.11.3 Construction of Class S bed and Surrounds

Class S pipe bed and surround shall be constructed as indicated on the Drawings.

The granular material shall be evenly spread over the full width of the formation and lightly compacted to a level slightly higher than level corresponding to the underside of the pipe barrel to allow for settlement of the pipe to the correct level.

Following placement and jointing of the pipe further granular material shall be placed in the trench, special care being taken to fill under the sides of the pipes to ensure full contact with the barrel of the pipe.

Field joints which have not been tested shall be left exposed for a minimum length of 150 mm each side of the joint. The granular material shall then be placed and compacted evenly on both sides of the pipe to a depth of 300 mm above crown of the pipe.

Trench supports shall be withdrawn gradually in accordance with the progress of the fill with the provisions that such withdrawal shall not prejudice the safety of the works.

The contractor shall ensure that the material to the sides of the pipe is adequately compacted in layers having a maximum thickness of 150 mm and that the method of compaction used shall achieve not less than 95 % of the maximum dry density as determined from IS 2720: Part 7

After each section of the pipeline has passed the hydraulic test, the exposed joints shall be backfilled and compacted to the above specification.

The same general requirements shall apply to Class N bedding.

### 6.11.4 Pipe Laying

Pipe shall be laid in accordance with IS 5822 unless otherwise specified herein.
The pipeline shall be constructed in lengths with a separate full time gang working on each length. The work on lengths may proceed concurrently. The programme for pipe laying shall be submitted to and be approved by the Engineer at the start of the contract. Any subsequent changes to the programme shall be submitted and approved by the Engineer before work to a different programme is started.. excavation for the pipeline in any one length shall not at any time proceed more than 2 km beyond the end of a hydraulically tested, completed and backfilled length of pipe, unless otherwise approved by the Engineer. The exposed joints between tested sections shall be disregarded in the above definition.
No metal tools or heavy objects shall be permitted to come into contact with the pipes or fittings. External coated pipe shall be handled at all times with wide non- abrasive canvas, rubber or leather straps or other equipment to prevent damage to the coating. The use of chains, wire slings, or any other handling equipment found to be injurious to the coating shall not be permitted. The timber or skids used to support the coated pipe prior to lowering into the trench shall not be properly padded with sufficient bags stuffed with sand or straw for protecting the coating. Alternatively, the pipe may be supported alongside the trench on mounds of sand. Any injury to the protective coating from any cause must be repaired before the pipes or fittings placed in the trench. During laying operations, no debris, tools cloth or other material shall be placed in the pipe. Pipes and fittings shall be lowered into the trench with equipment suitable for the weight of the pipes and fittings, and they shall be carefully cleaned before jointing.

Pipe shall be laid accurately to the lines and levels shown on the Drawings, within a tolerance of +- 10 mm.
Pipe alignments shall be straight between bends or curves. Length laid to curves shall only be allowed where shown on Drawings or in accordance with detailed proposals approved by the Engineers.
Properly painted sight rails shall be supplied and erected, with boning rods of predetermined measurement for the boning of individual pipes to the correct gradient. The sight rails shall be situated vertically above the line of the pipe or immediately adjacent thereto, and there shall at no time be less than three sight rails in the position on each length of the pipe under construction to any one gradient.
The contractor may submit to the Engineer for his approval an alternative method of the control of pipe laying to the correct levels and alignment.
The joining of pipes shall be made in accordance with the\e requirements of this specification.
The Contractor shall obtain from manufactures all special information regarding the handling of the pipes, joints, and other fittings and he will be deemed to have made him thoroughly conversant with all phases of pipe laying before commencing the works.
A "badger" or "bung" about 10mm smaller than the internal diameter of the pipe shall be kept in the pipe at all times, pulled forward as the work progress. When pipe laying is not in progress, including overnight, the open ends of the pipeline shall be blanked off with a temporary watertight fitting approved by the Engineer. The pipe shall be suitably held down so that the pipe does not become buoyant in the event of the trench becoming flooded.
To restrict the flow of rain runoff along the trench the contractor shall be plug the trench with backfill material at distances not exceeding 250 m until the pipeline can be filled in. the plugs shall be removed when trench filling is taking place. In granular bedding areas the plugs shall be of clay and shall be left in.

### 6.11.5 Level Control

The criterion for the level to which transmission main shall be laid such that the cover above the crown of the pipe to ground level shall be as specified in the drawings but in no case shall be less than 1200 mm unless otherwise directed by the Engineer.

### 6.11.6 Laying to Curves

Where pipes are to be laid to curves, the deflection at each joint shall not exceed one degree. For sharper curves specifically made bends shall be provided.

### 6.11.7 Lowering and Jointing

The pipe shall be lowered into the trenches such that no part of any shoring is disturbed or damaged and if necessary, additional temporary struts may be fixed during the lowering operations. Care shall be taken to ensure that the longitudinal joints of two consecutive pipes at each circumferential joint are staggered by 90 degree. While assembling the pipes, the ends shall have to be brought close enough to leave a uniform gap not exceeding 4 mm. there shall be no lateral displacement between the pipe faces to be joined. If necessary, spiders from inside and tightening rings from outside or other suitable equipment shall be used to bring the two ends in perfect contact and alignment. In no case shall hammering or longitudinal slitting be permitted. Jacking may be permitted for this purpose in particular circumstances and approval by the Engineer.
When the pipe is properly assembled firmly supported on wooden beams and wedges or by other approved means it shall be checked for correct line and level and tack welded. The tack welded circumferential joints shall then be welded fully.
On completion of the pipe jointing the external portion shall be coated with M15 concrete and the trench and the welding pits shall be cleaned. The welding pit shall be filled with approved bedding.

### 6.11.8 Floatation

The contractor shall take proper precautions against the risks of floatation and the flooding of the excavated works and shall make due allowances in his programme for any closure he considers necessary on account of monsoon.

Should any section of the pipeline be affected by floating in the course of works the entire work shall be removed and then reinstalled to the satisfaction of Engineer. The entire cost of laying it again to the correct line and level shall be to account of the Contractor.

**6.11.9 Steel Props**

In order to effectively provide cement mortar lining to the inside of the pipes and to avoid difficulties during the work, it is necessary that the roundness of the pipes is maintained circular till the lining work is taken up. To achieve the same, steel adjustable screw type props of screw or similar approved type consisting of minimum six legs (three props) shall be fixed inside the pipe and the diameter correctly set.

The design and drawings of the props that the contractor intends to use should be approved by the Engineer before starting the work. These props shall be fixed vertically at intervals as directed by the Engineer. The props should be kept in position at least for three days after the encasing of the pipe in that section is completed or until refilling is done to the full height of fill over the pipe in case the pipes are not encased. The props shall be removed only after obtaining permission from the Engineer.

**6.12 Internal Cement Mortar Lining**

All pipes and fittings shall be internally lined with cement mortar in accordance with IS:11906/AWWA C602. Cement mortar in lining shall be applied in-situ after pipe laying and after sectional hydraulic testing.

Cement shall be Portland cement in accordance with IS 8112

Sand used for lining shall be tested with standard sieves as per IS 460 and requirements specified in IS 11906

The minimum cement content shall be 100 kg/m3 and the water : cement ratio by mass shall be between 0.3 and 0.45:1

The mortar shall stop 100 mm back from the faces of any joints. The end face shall be vertical.

6.12.1 Surface Preparation

The interior surface of the pipe to be lined shall be cleaned to remove all rust, chemical or other deposits, oil, grease and all accumulations of water, dirt, and debris. The cleaning of the surface shall be carried out by the use of suitable chemical or mechanical means to the approval of the Engineer. The extent of cleaning shall be to the satisfaction of the Engineer.

All loose mill scale, dirt, rust, and accumulation of construction debris shall be removed from the interior of the steel pipeline. The pipeline shall be cleaned by use of a power-driven cleaner incorporating revolving brushes on rotating arms.

Immediately prior to the travel of the lining machine through the pipeline, all foreign material shall be removed. This includes small sand and loose mortar that might have accumulated since the work of preparation of surfaces was completed.

6.12.2 Mix Proportion

Proportion of sand to cement shall not be more than 1.5 parts sand to 1 part by volume. Mortar composing of cement, sand and water shall be well mixed and of proper consistency to obtain a dense, homogeneous lining that will adhere firmly to the pipe surface. The cement mortar mix shall comply with strength and density requirements specified in IS 11906/AWWA C602. No admixtures shall be permitted unless approved by the Engineer.

6.12.3 Thickness of Lining

The lining shall be placed by centrifugal method in one course by a machine traveling through the pipe and discharging the mortar at a high velocity over all pipe sections and long radius bends. The discharge shall be from the rear of the machine so that the freshly applied mortar will not be marked. The rate of travel of the machine and the rate of mortar discharge shall be mechanically regulated so as to produce uniform thickness throughout. The mortar must be densely packed and shall adhere to the pipe wherever applied.

### 6.12.4 Surface Finish

Mortar lining shall be mechanically trowel led except for the places where hand toweling is expressly permitted by the Engineer.

The lining shall be provided with attachments for mechanically trowel ling the mortar. Both the application and toweling of the mortar shall take place at the rear of the machine so that the freshly placed and trowel ling of the mortar will not be damaged. The trowel attachment shall be such that the pressure applied to the pipe will be uniform and produce a lining of uniform thickness with a smooth and even finished surface free of spiral shoulders. The finished surface of machine placed and trowel led linings in pipe shall be examined according to the following procedure.

Thickness of lining shall be ascertained frequently during placing of mortar and trowel ling using an approved non-destructive method.

In the stretch of pipe that has been lined and trowel led in each day's run, ten places shall be selected in straight sections of the pipe by the Engineer. In each of the ten places the thickness of the lining shall be re measured by non-destructive means as directed by the Engineers.

Defects in lining including but not restricted to sand pockets, voids, over sanded areas, blisters, cracked and dummy areas, and thin spots shall be removed, and the area shall be repaired to the full required thickness of the mortar lining. Defective areas encompassing the full diameter to the pipe shall be replaced by machine. Defective lining rejected at the time of lining shall be removed before initial set of the mortar. Defective lining rejected after initial set shall be replaced or repaired by the most practical method as determined by the Engineer.

Hair cracks or cracks up to 0.25 mm width and not over 300 mm in length in finished linings may be considered acceptable at the discretion of the Engineer but larger cracks shall be repaired or removed and redone all as directed by the Engineer.

### 6.12.5 Hand application

Cement mortar lining of bends, specials, areas closely adjacent to valves and other such places where machine placing may not be practical shall be performed by hand. The Engineer may order the correction for any defect by hand application.

Cement mortar for hand work shall be of the same materials as the mortar for machine placed lining.

The areas to be lined shall be thoroughly cleaned as specified earlier and, if necessary, shall be moistened with water immediately prior to placing the hand- applied mortar.

Steel finishing trowels shall be used for the hand application of cement mortar, except at bends the outer edges of hand trowel led areas may be brushed in order to reduce the abutting offset.

All hand finishing work in a section of the pipeline shall be completed within 24 hours after completion of the machine application of mortar lining that section. If necessary, application of mortar lining by machine shall be delayed or stopped to assure compliance with this schedule.

Hand placed mortar shall have a uniform and smooth surface with smooth transitions to adjacent machine placed linings.

### 6.12.6 Curing

Curing shall commence immediately after completion of the mortar lining and hand finishing of a section of pipeline. This shall, not be later than 8-hours after mixing of mortar. The lining shall be kept continuously in moist condition for a period of 14 days. During the operation of lining, finishing and curing, exterior surface of the pipe exposed to sunlight shall be sprinkled with enough water to keep the pipe cool. Open ends of pipes shall be suitably closed so as to maintain a moist atmosphere and prevent draught. Curing of mortar lining and simultaneous cooling of the pipeline externally shall be continued even beyond the period of 14 days if so directed by the Engineer.

### 6.12.7 Tests

Test blocks of the same material as used for the lining shall be made in 150 mm cube moulds and subjected to cube crushing tests. Each block shall be removed from its mould as soon as practicable and cured under the conditions of temperature and humidity identical with those in

which the lining of the pipe is cured. The number of tests shall be at least 4 cubes for each age and water cement ratio for each day's work. The work cube strength of the test cube shall not be less than 300 kg/cm$^2$ after 28 days of curing or 170 kg/cm$^2$ of 7 days of curing. The density of the test cube shall not be less than 2300 kg/m$^3$

### 6.12.8 Backfilling

On completion of the pipe laying operations in any section, for a length of about 100m and while further work is still in progress, refilling of trenches shall be started by the contractor with a view of restricting the length of open trenches. Pipe laying shall closely follow the progress of trench excavation and the contractor shall not permit unreasonably excessive lengths of trench excavation to remain open while awaiting testing of the pipeline. If the Engineer considers that the contractor is not complying with any of the foregoing requirements, he may prohibit further trench excavation until he is satisfied with the progress of laying and testing of pipes and refilling of trenches. Filling to a level of 300 mm above the crown of the pipe shall be done in accordance with the requirements of the clause on bedding. Care shall be taken during backfilling, not to injure or disturb the pipes, joints or coating. filling shall be carried out simultaneously on both sides of the pipe so that unequal pressure does not occur. walking or working on the completed pipeline shall not be permitted unless the trench has been filled with the instructed bedding and surround material, up to height of at least 300 mm over the top of the pipe except as may be necessary for trapping etc., during backfilling work.

The remaining portion of the trench shall be filled in which selected excavated material free from and topsoil, vegetation or boulders and colds of earth larger than 75 mm in size. Filling shall be done in layers not exceeding 150 mm in thickness accompanied by adequate watering, ramming etc., so as to be compacted to 95 % of the maximum dry density as per Part 7 of IS: 2720. The water contents of the soil shall be kept near the optimum moisture content as possible. The trench shall be refilled so as to build up to the original ground level, keeping due allowances for subsequent settlement likely to take place. The surface of the refilled excavation shall be left slightly higher than the adjacent ground and be maintained by the contractor to a smooth even slope.

The Engineer shall, at all times, have powers to decide which portion of the excavated materials shall be used for filling and in which portion of the site and in what manner it shall be used.

If suitable material for refilling is not available from already excavated material the Contract shall import material of approved quality as directed by the Engineer.

Regular measurement of the field dry density shall be taken by the Contractor at various levels in the backfilling as required by the Engineer.

No mechanical plant other than approved compacting equipment shall run over or operate within the trench until backfilling has reached its final level or the approval for the Engineer has been obtained.

Should any subsidence take place either in the filling of the trenches or near about it during The works the Contractor shall make good the same at his own cost.

Surplus excavated material shall be used to fill in any low spots above the pipeline which are identified on the Drawings or are instructed by the Engineer. Such material shall be evenly placed and compacted in layers not exceeding 200mm thick after compaction. The method of compaction employed shell achieve not less than 90% maximum dry density as determine from IS 2720: Part 7. Unless approved of by the Engineer, the width of areas to be filled shall not exceed 20m.

## 6.13 Valves

### 6.13.1 General

Valves shall be as per IS recognized standards. Flanges shall be machined on faces and edges to ISO 7005, IS 6392 or BS 4504.

Valves shall be double-flanged type and the face shall be parallel to each other and flange face should be at right angles to the value centerline. Backside of value flanges shall be machined or spot faced for proper seating of the head and nut.

Valve buried or installed in underground chamber, where access to a hand wheel would be impractical, shall be operated by means of extension spindle and/or keys.

Valves of diameter 450 mm and above shall be provided with lifting eyes and shall have detachable bolted covers for inspection, cleaning and servicing.
Valves shall be suitable for frequent operation as well as operation after long periods of idleness in either open or closed position
The valve stem, thrust washers, screw, nuts and all other components exposed to water shall be of a corrosion resistant grade of stainless steel.
Valves shall be free from sharp projections.
Butterfly and non-return values shall be provided with bypass arrangement. This may be integral with value or connected between pipes.

### 6.13.2 Butterfly Valves

Metal seated butterfly value shall be as per IS 13095/ BS 5155. Valve shall be suitable for mounting in any position.
The valve seat shall be of integrally cast or replaceable design. When the value is fully closed, the seal shall seat firmly so as to prevent leakage. The seat surface shall be machined smooth to provide a long life for the seal.
All fasteners shall be set flush so as to offer the least resistance possible to the flow through the valve.
All valve, spindles and hand wheels shall be positioned and vice versa shall be limited to about 5 minutes. The valve shall be suitable for controlling flows by throttling.
Valves shall be provided with enclosed gear arrangement for ease of operation. The operation gear shall be such that they can be opened and closed by one man against an unbalanced head 15% in excess of the maximum specified rating. Valve and any gearing shall be such as to permit manual operation on a reasonable time and not exceed a required rim pull of 400 N.
All hand wheels shall be arranged to turn in a clockwise direction to close the valve, the direction of rotation for opening and closing being indicated on the hand wheels. Hand wheel shall be provided with an integral locking device to prevent operation by unauthorized person.

**Material of Construction:**

Body: Cast steel (Conforming to ASTM A216 Gr WCB)
Disc: Cast steel (Conforming to ASTM A216 Gr WCB)
Shaft: Stainless Steel (BS 970 431 S29)
Seat Ring: Stainless Steel: ASTM A 743 CF8
Bearing: Teflon

Size of valves and pressure rating as per Bill of Quantities. Location of valves shall be as per contract drawings.
The contractor shall provide test certificates for materials, strength and leakage shall in accordance with BS5155 or relevant international standards.

### 6.13.3 Sluice Valves

Sluice valve shall conform to IS 780 and IS 2906 or relevant internationally recognized standards.

They shall be of non-rising spindle type. The valve shall be furnished with a bushing arrangement for replacement of packing without leakage. They shall also have renewable channel and shoe linings. The gap between the shoe and channel shall be limited to 1.5 mm

The gate face rings shall be screwed into the gate or alternatively securely pegged over the full circumference.

All valves, spindles and hand wheels shall be positioned to give good access for operational personnel.

All hand wheels shall be arranged to turn in a clockwise direction to close the valve, the direction of rotation for opening and closing being indicated on the hand wheels.

**Materials of Construction:**

| | |
|---|---|
| Body of gate | Cast iron to IS: 210 Gr FG 200 |
| Spindle | Stainless steel BS 970 gr 431 S29 |
| Seat Rings | Stainless steel ASTMA 743 CF8 |
| Back Seat Bush | Bronze; IS 318 Gr LTB2 |
| Shoe & Channel Lining | Bronze; IS 318 Gr LTB2 |

Size of valves and pressure rating as per Bill of Quantities. Location of valves shall be as per contract drawings. The contractor shall provide test certificates for materials, strength and leakage shall be in accordance with BS 5150/ IS 750.

The design and locations of washouts are shown in drawings. Exact positioning shall be determined by the Engineer with regard to topography. With regard to washouts at least 3 m of the washout pipe work, inclusive of the isolating valve, measured from the center line of the pipeline shall be laid at the same time as the pipeline and suitably capped to prevent ingress of foreign material. The minimum gradient for the washout pipe work shall be 1 in 100, if not shown in Drawings.

### 6.13.4 Air valves

The air valve shall be capable of exhausting air form pipe work automatically when being filled. The air being released at a sufficiently high rate to prevent the restriction of the inflow rate. Similarly the valve shall be capable of ventilating pipe work automatically when being emptied, the air inflow rate being sufficiently high to prevent the development of a vacuum in the pipelines. The valve shall also automatically release air accumulating in pipe work during normal working conditions.

Air valve shall be of the double orifice type with a large orifice for air entry into the pipeline and smaller orifice for automatic release of air under normal working pressure. The valve shall be suitable for the maximum working pressure in the systems. All air valves shall be provided with isolating valve and flanged end connections.

Air valve shall be designed to prevent premature closure prior to all air having been discharged from the line. The orifice shall be positively sealed in the closed position but the float (ball) shall only be raised by the liquid and not by a mixture of air and liquid spray.

The seating shall be designed to prevent the floats sticking after long periods in the closed position.

Air valve shall comprise of cast iron body having faced and drilled flange at inlet and with two chambers each housing a ball. One chamber shall have small orifice and other a large orifice. Balls shall be of injection moulded plastic with high impact strength or any other suitable approved material.

**Materials of Construction:**

| | |
|---|---|
| Body/cover | Cast Iron (IS 210 Gr FG 220) |
| Seat ring | Gun metal (IS 318 Gr II) |
| Float/Balls | Vulcanite |

Valves shall be DN 200 and shall be PN16 pressure rating. Location of valves shall be as per contract drawings.

The contractor shall provide test certificates for materials and properties shall be in accordance with relevant standards.

Before carrying out pipeline pressure testing the contractor shall verify with the supplier of the air valves that the valves have the capacity to sustain the pipeline test pressures. In the event that they do not sustain the pressure the valves shall be removed and the stubs off the pipeline shall be blanked off before pressure testing the pipeline.

### 6.13.5 Stubs

Stubs for air valves, scour valves and pressure relief valves of required dimensions as specified in the drawings shall be fabricated by the contractor and shall be fixed to the pipeline.

### 6.13.6 Nuts, Bolts and Washers

Unless otherwise specified, nuts, bolts and washers shall be galavanished and/or zinc electroplated conform to the requirements of IS 1364. Bolts shall be of sufficient length that at least one thread but not more than three threads shall show through the nut when in the fully tightened condition.

### 6.14.1 Anchor Blocks

Anchor blocks shall be provided at horizontal bends, vertical bends/ and at intervals on pipelines with gradients in excess of 1 in 6 as noted on the drawings, and at other locations ordered by the Engineer. The anchorages shall be made from concrete and constructed to the dimensions shown on the drawings. Where faces of anchor blocks are shown to bear against undisturbed ground, the contractor shall take all necessary measures to ensure that such bearing is given over the full dimensions shown.

Curves formed by welded bends and pipe lengths will not require anchoring unless specifically shown in the drawings.

Welded pipelines shown on the drawings as having tied couplings an flanges shall require anchor blocks only at the positions specifically noted on the drawings.

### 6.14.2 Vertical Thrust Blocks

Vertical thrust blocks shall be located wherever there is a transition between above ground and buried pipelines. All vertical thrust blocks shall have flexible joints at either end to allow for small amounts of settlement to occur. The contractor shall undertake the construction of the thrust blocks as early in of settlement to occur. The contractor shall undertake the construction of the thrust blocks as early in the programme of work as is practical and at least six months prior to the installation of the above ground pipeline, in order to reduce the risk settlement of imposing additional loads on the pipeline supports.

Where possible the base of the thrust block shall be cast against solid rock in order to prevent any settlement. Any material overlaying the rock shall be excavated and replaced with class M15 mass concrete. In the event of no rock being encountered the base of the thrust block shall be cast against undisturbed ground. Any ground which in the Engineer's opinion is unsuitable shall be excavated and replaced with class M15 mass concrete.

## 6.15 Internal Cleaning of Pipeline

Pipeline shall be cleaned of all dirt, debris, dust or other deposits by repeated hosing of copious quantities of water on the pipe surface and simultaneously rubbing the surface with gunny cloth to the satisfaction of Engineer. Cleaning with metal cleaning solution, acid, wire brushes, scrappers or sand paper shall not be permitted.

The section of the pipeline once cleaned shall not be entered into for any purpose later. Sufficient precaution shall be taken to prevent the ingress of any dirt, debris, or dust inside the section. Failing this the section shall be cleaned again at the discretion of the Engineer.

In the case of above ground pipeline, the length of the section to be taken up for cleaning shall be decided in consultation with the engineer from the point of view of ventilation etc.

In case of buried pipeline a section shall be taken up for cleaning after the work of back filling around and over the pipeline is completed and the spiders have been removed from inside with approval of Engineer.

During the pipeline operation in the adjoining section, the contractor shall take all the precaution to prevent ingress of water, debris, dirt, etc in the cleaned section, failing which the section shall be cleaned again at the discretion of the Engineer. When deemed necessary by the Engineer suitable closures shall be provided at the open end or the ends of the cleaned section.

No separate payment will be made for the work of cleaning and providing closures. The rates coated for the laying of pipes shall include the cost of cleaning also.

## 6.16 Hydraulic Testing Pipeline

Pipelines and fittings shall be subjected to hydraulic pressure test in the presence of the Engineer which shall comply with IS 5822 unless otherwise specified.

Testing shall be carried out in two stages:

Test of section as construction proceed before internal cement mortar lining

A test of the hole of the pipeline on completion

The contractor shall equip with all plants, equipment, fittings and water necessary for the hydraulic tests. The contractor shall submit to the Engineer, well in advance of the time of test, details of proposals, including the supply of water either by tankers or bore holes. No connections from the existing pipelines will be allowed, nor will any connection to the pipeline and pipe work which would involve cutting, tapping or altering the permanent works be allowed.

Test gauges shall be of approved manufactures having dials at least 200 mm diameter, graduated such that the test pressure is at least 75% of the full-scale reading shall be used. If necessary different gauges shall be supplied for different pipeline section. Two gauges shall be provided for the sole use of the Engineer and shall remain in the engineer possession for the duration of the contract. All gauges shall be dead weight tested and calibrated at the commencement of work and at regular intervals as require by the Engineers.

The contractor's arrangements for testing shall include a suitable means of quick installation and removal of the Engineers gauges during testing.

### 6.16.1 Testing Procedure

The sectional hydraulic test shall be carried out after the pipeline section to be tested as been laid, jointed and back filled to a depth sufficient to prevent flotation, but leaving the joints exposed which have not been tested. The sections to be tested shall be to the approval to the Engineer and shall be no longer than 2000m or 500 m when either pipeline is laid adjacent to or underneath the carriage way or when section includes an air valve chamber. The joints between each tested section shall be left exposed until the pipeline has passed the test on completion.

This test shall be undertaken within one month of the contractor commencing the laying of the pipes. Should the pipeline fail the test or the contractor fail to undertake the test, all laying and welding work shall come to a halt until that section of pipeline passes a hydraulic test.

Each length of the pipeline to be tested shall be capped or blanked off at each end and securely strutted or restrained to withstand the forces which will be exerted when the test pressure is applied. Testing against closed valves will not be permitted. Washout valves shall be fitted with blank flanges and these together with in-line valves shall be left open. Air valves already fitted shall be permitted to function during the test.

Proposals for testing where thrusts on structures are involved, even where thrust flanges on the piping are installed, shall be submitted, with the calculations of the forces to be carried, to the Engineer for approval.

The method of filling the pipeline with water shall be approved by the Engineer. The length under test shall be filled making certain that all air is displaced through an air valve installed at the top of the blank flange situated at the high end of the line. The length shall then remain under constant moderate pressure, 10 to 20m head of water, for a period of several hours until the pressure can be maintained without additional pumping.

The pressure shall then by slowly increased at a maximum rate of 1 bar per minute to the full test pressure and pumping discontinued for 3 hours or until the pressure has dropped by 10 m, whichever occurs earlier. Thereafter pumping shall be resumed and continued until the test pressure has been restored. The quantity of water pumped to restore the pressure shall be the measure of leakage from discontinuation of pumping until its resumption.

The pipe length shall passes the test if the leakage is not more than 0.33 liters per mm diameter per kilometer per 24 hours for each 100m head of pressure applied.

Notwithstanding the satisfactory completion of the hydraulic test, if there is any discernible leakage of water from any pipe or joint and repeat the hydraulic test.

No pipeline shall be accepted until the leakage on any length is not more than the rate of leakage specified above and all sources of leakage have been rectified.

The test on completion shall be carried out after all the pipeline sections have been satisfactorily tested and the joints between each section completed to provide a continuous test length between pipelines shall be tested as above except where the Engineer issues

such instructions as are necessary for testing parts of the works that have been designed for stresses limited by considerations other than those applying to the pipeline systems.

### 6.16.2 Test Pressures

Test pressures are to be measured in bars at the center of the blank flange situated at the lowest end of the pipeline under test. Unless otherwise specified or shown on the drawings pipeline test pressure shall be in accordance with the following:

Steel pipe and fittings 8, 10 and 11 mm wall thickness 18 bar Test pressure for sections of pipeline containing air valve chambers shall be such that the pressure at the chamber does not exceed valve design pressure as specified by manufacturer.

When undertaking a Test on completion of the pipeline length may contain pipes of different wall thickness in such cases the lower of the different test pressures shall be used.

## 6.17 Pipeline Disinfections

Upon completion of a newly laid main, the main shall be cleaned, disinfected and dewatered as directed by the Engineer.

The internal surface of pipelines, specials, appearances shall be disinfected using chlorine solution in accordance with procedure specified in IS 5822. Alternative methods may be adopted with the approval of the Engineer. The chlorinated water shall stand in pipeline for a minimum period of 24 hours and all valves in the system shall be operated twice during this period.

The chlorinated water shall be neutralized and disposed off as directed by the Engineer.

After final flushing and before the pipeline is placed into service, water samples shall be collected and tested for bacteriological quality and shall not indicate the presence of coli forms. If the initial disinfections fail to produce satisfactory results, disinfections shall be repeated until satisfactory samples are obtained.

The contractor is expected to carry out the cleaning, disinfecting and dewatering work as a part of laying the pipes and his rates for laying the pipes should include the cost of cleaning and other related works.

## 6.18 Markings

Details like valves type, size, and cistern number shall be painted on the valve chambers as directed by Engineer.

## 6.19 Measurement and Payment

The measurement of the pipes for items specified in Bill of Quantities shall be on running meters of net length along the centerline of the pipe excluding the length of specials and appurtenances.

Specials shall be paid separately on the basis of provision made in the Bill of Quanitities. For the payment purpose, flanges shall be either included in or excluded as described in the Bill of Quantities. However materials such as nuts, bolts, and washers, etc., shall be included in the respective terms.

Valves shall be paid on number basis as mentioned in the Contract Data.

Payment for fabrication of pipes and specials shall be made after successful testing and delivery to work site. Payment for laying the pipes and specials shall be made as mentioned in the Contract Data.

Lining and coating shall be measured by surface area coated or lined in square meters. For coating the outer diameter (before coating) of pipe barrel shall be considered and for lining internal diameter (before lining) of pipe barrel shall be considered.

## 7. ANCILLARY STRUCTURES

7.1 The Contractor shall build Valve Chambers & Thrust Blocks/Anchor blocks and such other miscellaneous structures that may be required at the locations shown by the Engineer and as shown in the drawings or as may be otherwise specified or directed. unless otherwise specified in this Chapter or advised by the Engineer based on the site conditions.

The various structures shall be built as the pipe laying progresses and the Engineer at his discretion, may stop work entirely on the laying of pipe or construction of other structures, until the construction of the structures already approved by the Engineer are completed by the Contractor.

### 7.2 Thrust Blocks

Thrust blocks shall be provided for both horizontal and vertical bends as suggested, for effective transfer the hydrostatic thrust developed during the operation of the rising main. They shall be constructed at the locations shown in the alignment drawings, and are of the respective dimensions shown therein. The surrounding virgin land of the thrust blocks shall not be disturbed, to effectively transfer the thrust developed in the main.

### 7.3 Valve Chambers

RCC valve chambers shall be provided for all valves. These valve chambers are of different sizes suitable for air valves, scour valves & Control valves with RCC pre-cast slabs covering.

7.4 Structures for Crossing Canal/ Nallahs and Other Miscellaneous Structures

Structures for crossing the pipeline over canals/Nallahs and other miscellaneous structures not listed in these specifications but may be required to be built shall be as per construction drawings and as described in Bill of quantities. The materials of construction of workmanship for those structures shall conform to the relevant Standard Specifications. The measurement of quantities involved in these structures for payment shall be done as per dimensions of the respective drawings.

### 7.5 Grade of concrete

#### 7.5.1 Ordinary Concrete

In case of ordinary concrete, mix is not required to be designed by preliminary tests and proportions of cement, fine aggregates and coarse aggregates are specified by volume. The ordinary concrete shall be in four grades designated as M 7.5, M 10, M 15 and M 20. It can also be specified by volumetric mix as given in Table-4 below. For cement which normally comes in bags and is used by weight, volume shall be worked out taking 50 kg of cement as 0.035 cubic meters in volume. Shaking, ramming or hammering shall not be done. Proportioning of sand shall be as per its dry volume and in case it is damp, allowance for 'bulkage' shall be made as per IS: 2386 (Part III).

Ingredients required for ordinary concrete containing one bag of cement for different proportions of mix shall be as given in Table-4 below.

Table-4

**Ingredients Required for Ordinary Concrete**

| Grade of Concrete* | Nominal Mix by volume Cement: Fine Aggregate: Coarse Aggregate** | Total quantity of dry in kg (max) by mass per 50 kg of cement (to be taken as the individual masses of fine and coarse aggregates) | Quantity of water in liters (max) per 50 kg of cement*** |
|---|---|---|---|
| M 7.5 | 1:4:8 | 625 | 45 |
| M 10 | 1:3:6 | 480 | 34 |
| M 15 | 1:2:4 | 350 | 32 |
| M 20 | 1:1.5:3 | 250 | 30 |

* In the designation of a concrete mix, letter 'M' refers to the mix and the number refers to the specified 28 days' works compressive strength of that mix on 150 mm cubes, expressed in N/ sq. mm.

** The proportions of the aggregate shall be adjusted from upper limit to lower limit progressively as the grading of the fine aggregates becomes finer and the maximum size of coarse aggregate becomes larger.

*** The amount of water should be kept minimum required for proper workability. The quantity given in the column is not to be exceeded.

**7.6 Strength Requirement of Concrete**

Where Ordinary Portland Cement conforming to IS.269 or Portland Blast Furnace Cement conforming to IS:455 is used, the compressive strength requirements for various grades of concrete controlled as well as ordinary shall be as given in Table-5. Where rapid hardening Portland cement is used, the 28 days compressive strength requirements specified in Table-5 shall be met at 7 days.

For controlled concrete, the mix shall be so designed as to attain in preliminary tests a strength at least 33 per cent higher than that required on work tests for concrete up to and including M 25, and 25 per cent higher for higher grades. Preliminary tests need not be made in case of 'ordinary concrete'.

**Table-5**

Strength Requirements

| **Grade of Concrete** | **Compressive test Strength on 150 mm cubes after testing in accordance with IS: 516 (N/sq.mm)** | |
|---|---|---|
| | **Minimum at 7 days** | **Minimum at 28 days** |
| M 10 | 7 | 10 |
| M 15 | 10 | 15 |
| M 20 | 13.5 | 20 |
| M 25 | 17 | 25 |

In all cases, the 28 days compressive strength specified in Table-5 shall alone be the criterion for acceptance or rejection of the concrete.

Where the strength of a concrete mix, as indicated by tests, lies in between the strength for any two grades specified in Table-5, such concrete shall be classified for all purposes as a concrete belonging to the lower of the two grades between which its strength lies.

**7.7 Use of Plums in Ordinary Concrete**

Stone Plums shall not be used unless specified in the drawings. When stone plums are used, the size may be from 150 to 300 mm. The maximum dimension of these stones or plums shall not exceed 1/3rd the least dimension of the members.

All plums shall be hard, durable, clean and free from soft materials or loose pieces or deleterious substances in them and shall not have sharp corners.

During concreting the first layer of concrete of the specified mix shall be laid to a thickness of at least two and a half times the thickness of the maximum size of plums to be used. The plums shall then be laid while the top portion of this concrete is still green but sufficiently stiff to prevent complete submergence of the plums under their own weight. These plums shall be about half embedded in the concrete and the remaining part exposed so as to form a key with the next layer of concrete. No plums shall be used for concrete-laid under water.

While placing the plums, care shall be taken to see that the clear distance between any two plums is not less than either the width or thickness of either of the plums. The distance from plums to the outer surface or from any steel reinforcement shall be equal to greatest width of the plum.

If plums of stratified stone are used, they shall be laid on their natural bed. Stones with concave faces shall be laid with the concave portion upwards. The thickness of the next and successive layers of concrete shall be at least twice that of the largest plums. The total volume of plums shall not exceed 15% of the volume of the finished concrete.

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